

NATURE MAGAZINE

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"Dove Moaners"

Under the title "Debunking the Dove Moaners," the sportsman's weekly, *Outdoor Georgia*, indulges in some plain talk that can also be applied to other gunner-moaners protesting restrictions on the shooting of other birds. Says *Outdoor Georgia*:

"The more you see and hear hunters and fishermen the more you wonder how many centuries it will take to satisfy them. Ever since the first curtailment of the dove season, and the reduction of the bag limit several years ago, Georgia gunners have been moaning to the high heavens. Many of them have never paused to refresh their memories of the good old days when 100 birds a day was a low gun on an old-fashioned South Georgia shoot. This overshooting for many years in our own backyard was directly responsible for shortened seasons and lower limits. . . .

"Game laws are not made to fit the whims and conveniences of gunners who would shoot the last bird. They are designed to give the maximum amount of sport to the greatest number of hunters. And this is as it should be. If the game laws were made to allow the greatest possible take, hunting soon would become a sad memory. . . .

"Just before the war the dove was dangerously close to a permanent perch on the songbird list. . . . Why should hunters moan for a better opportunity to make larger and quicker kills of the dove and again reduce him before he makes further population gains! It must be remembered that the bird, not the hunter alone, must be given some consideration. Survival of dove shooting as a favorite upland sport depends upon the survival and increase of the bird. . . . We must leave the present regulations alone, and be thankful for the opportunity to shoot doves at all."

For our part we should like to see the dove on the songbird list, for a while, at least. And we note no concern in this editorial for those whose interest in the dove is for the bird itself and not as a target. Nevertheless, it is hopeful to see such a strong attitude for maintaining restrictions designed to assure an adequate population of doves. It would be safer if the restrictions were even more stringent.

Feather Hobby

Mrs. O. L. Dart, 550 E. Amherst Street, Englewood, Colorado, is an active bird student, and, as a byproduct of her interest, is making a collection of bird feathers. She wonders whether any readers would be interested in sending identified feathers of birds in their localities, or exchanging feathers. So far as she knows her collection contains no feathers from birds that have been wantonly killed.

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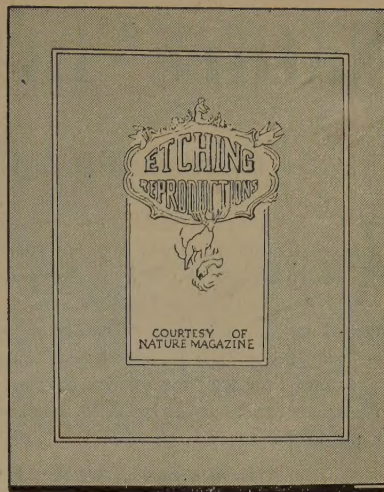
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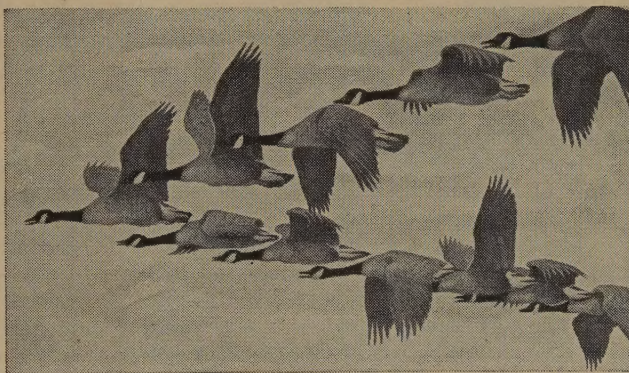
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Nature in Print

By HOWARD ZAHNISER

ALFRED Tennyson wrote a poem entitled "Ulysses," in which he imagines the talk of the hero of the Odyssey in his old age. Ulysses (or Odysseus as he is better known to some of us) recalls his ever-ready days of adventure when he was "roaming with a hungry heart," taking part in great enterprises, and fighting "far on the ringing plains of windy Troy." And, as he thinks it all over, he declares in one of Tennyson's simple great lines:

I am a part of all that I have met.

In *The Lost Woods: Adventures of a Naturalist* Edwin Way Teale describes himself in somewhat the same way while relating diverse experiences. What otherwise would seem a collection of magazine feature articles—as many of them, in fact, have been—becomes related to a personality that is significant in the Nature literature of our time. And, related to a personality, these experiences have a broader meaning. As Mr. Teale observes: "Memories of beauty, memories of moonlight and starlight, of wildflowers and birds in a cloud-filled sky are things of fundamental virtue. Remembering such things in times of stress brings us consolation." He quotes the English botanist and explorer, Reginald Farrer, to a similar effect: "And the ache in your heart for the things you have lost from sight becomes anodyne and enlightened in the joy of your heart over those things that we all possess inviolable forever." There is thus more than vicarious adventure in this book.

As a six-year-old Teale explored the forest area that became the lost woods of his title, and these woods—not only interesting in themselves but also invested by the boy's imagination "with a fearful and delicious atmosphere of secrecy and wildness"—became for him the scene of his induction into the order of naturalists. The *Lost Woods*, he writes, "was a symbol of all the veiled and fascinating secrets of the out-of-doors. It was the starting point of my absorption in the world of Nature."

"Thus, all the events recorded in this book," Mr. Teale himself explains, "began, in a way, in the *Lost Woods*. They are events that occurred on the diverse trails down which this interest in natural history has led me. They are the remembered days of a naturalist, experiences I have often re-lived in memory and here re-live on paper, recollections concerning such things as travels on a leaf, mountain hawkways, a mangrove wilderness, a visit to the heart of a cloud and the return of living fossils from the sea."

The "living fossils" of which he speaks are king crabs, described in a chapter that is good informative reading and illustrated by eight of the photographs for which Edwin Way Teale is noted. The mangrove wilderness is in southwestern Florida. Mr. Teale describes it after trips made with wardens of the National Audubon Society. The mountain hawkway is in Pennsylvania along the Hawk Mountain Sanctuary, which he has visited. The travels on a leaf are those of insects in the garden of which he wrote at length in his earlier volume *Near Horizons*. The cloud visit was, of course, an airplane flight, during which Teale saw close at hand the cloud formations he had

dreamed of from the ground, and during which he was somewhat disillusioned in the "clammy fog and the turbulence of cross-currents" that he experienced. (More fortunate was my own first cloud experience when, picking a course between the bulges of cumulus clouds, the pilot flew close and I was amazed to find that the clouds near at hand looked so much as they did from a distance. When grounded I had no disillusionment from which to recover, but, rather, could all the more enjoy the cloudy sky.)

Yet these examples are only a few of some two dozen adventures that are chronicled in this volume and illustrated with some two hundred most excellent photographs. Among the most sensational is the narrative of a struggle between a diamond-back rattler and an indigo snake (with half a dozen photographs), and among the most lovely is a sketch entitled "The Private Life of a Snowflake." There are two sketches in which Mr. Teale pays particular attention to Henry Thoreau—whom he admires much. In one of these the Concord-Merrimack boat journey of Thoreau and his brother is retraced (by automobile) on its hundredth anniversary—the September 2, 1939, that proved to be such a tense day of the then exploding World War II. In the other, Walden Pond is revisited, photographed, and explored for its wildlife.

The redwoods of California are in the book, and the woods of Maine. One of its most attractive narratives has the Adirondacks for a scene, where Mr. Teale and his wife lived for a vacation time a woods life in a small cabin and observed the wild creatures. "Natural History in Times Square" is the title of one chapter, and observations made in a submarine sequence of three chapters narrates a boat trip that Mr. Teale and a companion started to make from Louisville to New Orleans—as strange a trip as I have ever read about. It was the friend who wished to arrive in New Orleans, a wish that he soon found could be better satisfied in some other way than by the boat travel which he and Mr. Teale had selected. Teale, however, continued the journey to Cairo, and thus persisted to the end of the Ohio at least.

There are other personalities sketched in this book, too. A woman whose close associations with beavers proved a solace to her, and a man whose whittling of ducks kept him from work, are among the interesting people Mr. Teale has met, and his close acquaintance with Roger Tory Peterson has made possible a sketch of great interest and considerable value.

The fact is that—in all but its single authorship—*The Lost Woods* is after all more like some super-quality magazine than like the usual book. There are in it "articles" to meet many interests. It is a "magazine" in which are stored reading matter for pleasant browsing and casual reading in moments of not much leisure, as well as consecutive and thoughtful reading.

Yet the recollection of the "Lost Woods," which thirty years later Mr. Teale could never locate, so pervades the atmosphere of the entire volume when read as a whole that it has a unity and is a satisfying book for the shelves. Its style of writing is simple for the most part; straightforward narrative; vivid. In its introduction and conclusion it is philosophical, and occasionally it is somewhat fanciful. (One of its most enjoyable chapters is a sketch called "Boundaries of the Night" in which Teale, in imagination, follows the westward sweep of darkness.)

Throughout it is indeed very much alive, its experiences so real that they become a part not only of Mr. Teale but also of the reader. So far as I recall, it is not recorded of Ulysses

Lyric and Melody

By JOHN NIXON, JR.

I have been singing something that the trees
Wrote in collaboration with a breeze—
Wrote in a moment when the moon leaned down
And pinned a star upon each poplar's gown.
Words fashioned by a maple's burning lips
Were written by the willow's finger-tips
Into the ageless melody of air
And left to vibrate and to echo there.
I have been singing something that can be
Written only by zephyr and by tree.

that he could read, but if he could have Tennyson might well have had him say also, "I am a part of all that I have read." The obverse is more certainly true as far as Mr. Teale's readers are concerned, and those who are fortunate enough to read *The Lost Woods* will find that they have greatly enlarged themselves through the good offices of Mr. Teale's observations and recollections.

The Lost Woods: Adventures of a Naturalist. By Edwin Way Teale. New York: Dodd, Mead & Co. 1945. 326 pp., with 201 photographs on 95 plates, and index. \$4.

More Pacific Books

Insects of the Pacific World. By C. H. Curran. New York. 1945. The Macmillan Company. 317 pages. Illustrated. \$3.75.

Fishes and Shells of the Pacific World. By John T. Nichols and Paul Bartsch. New York. 1945. The Macmillan Company. 218 pages. Illustrated. \$2.50.

Publication of these two books rounds out the Pacific World Series brought out under the auspices of The American Committee for International Wild Life Protection. War produces little that is positive, but it did bring about this excellent series and thus fills in gaps heretofore vacant so far as popular texts are concerned. The author of the insect book is Dr. Charles Howard Curran, Associate Curator in the Department of Entomology of the American Museum of Natural History in New York. For the authors of the fish and shell book, the publishers turned to John T. Nichols of the Department of Ichthyology of the American Museum, and to Dr. Paul Bartsch, the distinguished Curator of Molluscs of the Smithsonian Institution. In the preparation of both volumes the authors have had to be selective in the material included. The Pacific is a vast area, and the policy has been, as in the whole series, to include those forms of the widest distribution and significance.

R. W. W.

Ring-necked Pheasant

The Ring-necked Pheasant and Its Management in North America. Edited by W. L. McAtee. Washington, D. C. 1945. The American Wildlife Institute. 320 pages. Illustrated in color and black and white. \$3.50.

While the foundation of this book is a report on studies on the ecology, life equation and management of the ring-necked pheasant in Ohio, it includes reports of similar character from other parts of the country. The authors, whose works have been gathered into this volume by Mr. McAtee, are all employees of the U. S. Fish and Wildlife Service. For the most part their studies were carried on through Cooperative Wildlife Research Units sponsored jointly by that Service, certain land-grant colleges, several state conservation departments and the American Wildlife Institute. The book will serve as a guide to pheasant propagation and management, and is of interest to all working in the field of management of wild game birds, as well as to gunners.

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Birds of El Paso

El Paso Birds. By Elsie McElroy Slater. 1945. Published by the Author at 516 Prospect Ave., El Paso, Texas. Illustrated. 58 pages. \$1.00.

This attractive little book is of particular interest to Texas bird lovers. Its charmingly written text comes from the notebooks of the author, who is a botanist and bird lover at one and the same time. Her information was, she says, gathered "along the Rio Grande, looking over and far into Mexico, hunting blue gentians, trying to see the piping baby meadowlarks under the dark alfalfa, past the cotton acres and chili patches circling the shifting sand dunes to find violet milkweeds, searching the lively foothills trying to outstare the collared lizard or catch the lavender and silver hibiscus in bud, climbing the high canyons of our mountains to see lichen painted walls—to the top, over the top of Mt. Franklin, El Paso's vast laboratory and class rooms for seven sciences and a thousand horizons."

Uranium

Uranium and Atomic Power. By Jack DeMent and H. C. Dake. Brooklyn, N. Y. 1945. The Chemical Publishing Company. 343 pages. Illustrated. \$4.00.

This is a practical book, written, as clearly as one can write about such an involved subject as atomic power, by two editors of mineralogical publications and writers on associated subjects. The object of the book is to give the layman, the student and the chemist the underlying principles and theories essential to a thorough understanding of the atomic bomb and atomic power.

Analyzing Statistics

Sequential Analysis of Statistical Data. New York. 1945. Columbia University Press. \$6.25.

This is a presentation of mathematical material on statistical data prepared by the Statistical Research Group, Columbia University, for the Applied Mathematics Panel, the National Defense Research Committee and the Office of Scientific Research and Development. It is published in loose-leaf form and for a select audience of mathematicians and statisticians.

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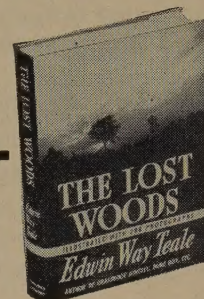


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Devoted to the Practical Conservation of the Great National Resources of America

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Moonstroke

By W. L. McATEE

"The sun shall not smite thee by day, nor the moon by night" (Psalm 121:6)

HAS mankind always been wrong about the moon, or does that orb have powers for good or ill (chiefly the latter) second only to those of that master of our sub-universe, the sun? Any dictionary suggests the story with such terms as moon-blasted, moon-sick, moon-struck, lunatic, and so on. Poets have abundantly sung of the influence of the moon upon lovers and we popularly recognize it by calling them loony or moony.

That the moon has definite biological effects is shown by the spawning periodicity of the Hawaiian palolo and the California grunion. It may be argued that these are secondary, the primary influence being through the tides. But there is no tidal effect in the moon-synchronized blooming of Morea flowers, the changes in electric potential of a maple tree, the feeding of screech owls, and the chanting of the chuck-will's widow. (Some of the facts used in the preparation of this article were gleaned from Leon H. Kelso's Biological Leaflets.)

Without subscribing to the cult that deems the success of all plantings dependent upon the sign of the moon, we may admit as a minimum that there is considerable evidence of lunar influence upon organisms.

As to effects upon man, there is much chaff to winnow but little grain to glean. The literature is chiefly medical and deals mostly with the alleged relation of the moon to epilepsy, hysteria, fevers, and night-blindness. Treatises up to book length have been devoted to the thesis that fevers are connected with, and affected by, the revolutions of the moon. That hypothesis, however, gets little credence now. Night-blindness and day-blindness have been discussed so long and so ineptly that the meanings of these terms and their technical equivalents have become hopelessly confused.

Thus, savants having been not too successful in the study of lunar influence upon the human race, it may be just as well to consider the testimony of a few laymen. As to blindness, Cuthbert Collingwood (*Rambles of a Naturalist*, 1868:309-310) reported that: "A

sailor lad 18 years of age after sleeping in the direct rays of the moon, for about a month could not see by moonlight, and narrowly escaped serious injury from falling. However, between decks and in daylight, or even in dark before the moon rose, he saw as well as ever." It is said that sailors very generally fear some such evil effect and that they throw a cloth over the face of any man found sleeping in the moonlight.

As to moonstroke or the like, I have been able to find only the evidence of Richard Burton, the famed adventurer and writer. While still a Lieutenant he published books on his experiences and findings in India. In *Scinde or the Unhappy Valley* (1851, 2:12), he stated that many an incautious Negro has risen in the morning from his sleep in the moonlight with one side of his face by no means the color of the other, and probably it took him months to recover from the effects of the moonblow.

Later, in *The Book of the Thousand Nights and a Night* (1885-1888, 2:4), he wrote: "Easterners still believe in the blighting effect of the moon's rays, which the Northerners of Europe, who view it under different conditions, are pleased to deny. I have seen a hale and hearty Arab, after sitting an hour in the moonlight, look like a man fresh from a sickbed; and I knew an Englishman in India whose face was temporarily paralyzed by sleeping with it exposed to the moon."

Notes and Queries (Ser. 3, 11:8) tells us that "The baleful effects of moonbeams are universally acknowledged by all wild or half-civilized people, always keen observers of nature. Dr. Madden and other travellers inform us how careful the Arabs and Egyptians are of sleeping in the moonlight. So it is also with negroes in the West Indies."

In summary, there is real evidence that moon cycles affect the lives and behavior of the so-called lower organisms, and there are strongly implanted beliefs as to lunar influence upon mankind. This, like all folklore, is of interest, but it requires investigation before adding to our stock of settled knowledge.

Acacia

By CAROLINE WADSWORTH TURNER

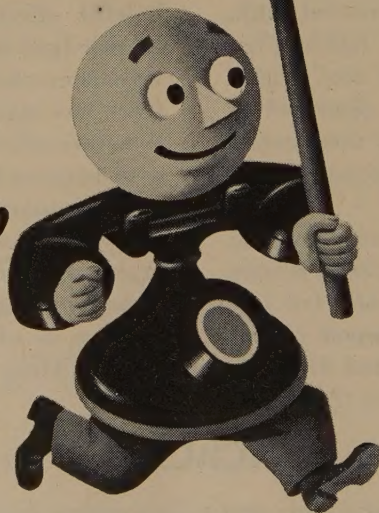
Acacia only needs pin-prick of sun
To fling a lava-burst of yellow bloom
At spring.

Over its naked, winter bole there flows
A canary-colored, many-tasselled mantle
Which glows

Like spattered gold on vital green,
Or neon arc on dimmed-out street,
Or phoenix flame.



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Contents Noted

A GOOSE, will never leave a crippled mate. This loyalty, combined with a long stalk and some hard, straight shooting meant a successful opening of the waterfowl season and roast goose for four Norris Lake hunters." So says a story in *Outdoor Georgia*. The quartet of sportsmen got within gun range, and one "dropped a goose as the flock rose from the water and the other four refused to leave their crippled member. They circled the lake and settled back down, honking in distress." An hour later the gunners were weighing all five birds. One of the members of the party was named Slaughter—no fooling—and the sportsman who bagged two of the five birds was named Wright. The editor of the Georgia publication heads the story, "Loyalty Costly."



IN THE process of building their formidable "Atlantic Wall," the Germans destroyed the famous woods that formerly grew between The Hague and Scheveningen in Holland. These two cities were key points in this defense system. On November fifth, 1945, a ceremony was held to inaugurate the replanting of that area. The first trees, and the more than two hundred thousand that are yet to be planted, were put into the ground by the school children of the two cities. Poplars, willows, birches, beeches and oaks are to be used to "populate" the ravaged area, and their care will be the particular responsibility of the school children. The Dutch authorities want these young people, through this activity, to carry into future years the remembrance of the German visitation. Someone with imagination thought this up—this living memorial to the courage of a people that would not be subjugated.

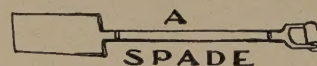


A RECENT news story with the dateline of Wagoner, Oklahoma, reported that Matt Kimes, "notorious 'kid' bandit of the 1920s", was on the loose again. Merchants on Wagoner's Main Street were reported to have readied their firearms, and FBI and local police had taken up vigil in upstairs offices in case Matt came in from the hills to indulge in one of his holdup robberies. The news story did not record the fact that Kimes had been sentenced to life imprisonment in Oklahoma for killing two police officers, or that he was an enthusiastic

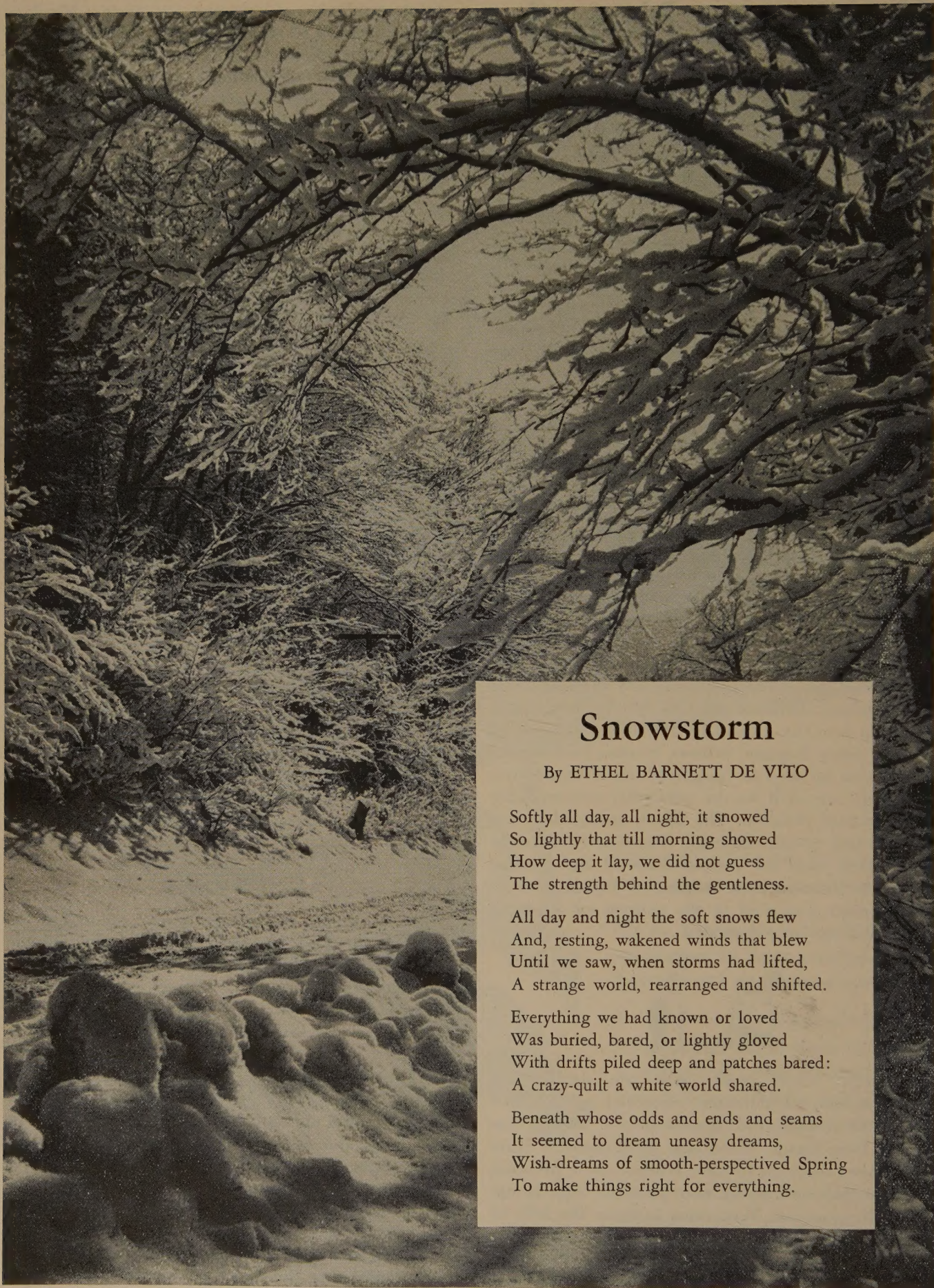
"sportsman" who, at least once, was given a few days off from prison so that he could indulge his hobby. Commenting on this back in 1935 we observed that: "The British are a sport-loving race, but as far as we have learned, they do not carry the matter to the point of turning life prisoners loose with a gun." Matt, later information reveals, was paroled because he had always returned to prison after his previous leaves, and because he appeared to have "got religion." However, armed with two revolvers and a 30-30 Winchester, he had helped rob a Texas bank, and held up a movie theater box office. P.S. Matt's hunting days are over. Recaptured, following injury in an automobile accident, he died in the hospital.



IN OUR December editorial we had some pointed things to say about calling things by their right names. In extension of that thought we note that the financial statement of the Division of Fish and Game of California for the 1944-45 fiscal year records an income of \$2,395,082.28, which constitutes a "Fish and Game Preservation Fund." In the same mail came a release from the same agency, the first paragraph reading: "The cock pheasant and the elusive quail take the hunting limelight this week in California, with the 'commence fire' order coming to State sportsmen at 10 a.m., Tuesday, November 20." These gunners took the field armed with licenses, the price of which went into the "Preservation Fund." We are not quarreling with the season, but we must call attention to the fact that Webster defines "preservation" as the "act or process of preserving, or keeping from injury or decay." Who is kidding whom?



AMERICANS are the greatest second-guessers in the world. They can wax indignant because the manager of the ball club ordered the batter to wait out the pitcher instead of hitting, and then have a third strike slipped by. They loudly condemn the quarterback for kicking, or trying an end zone pass, on fourth down, with inches to go and a good plunging back in the backfield. The greatest example of second-guessing is the Pearl Harbor inquiry. The Japs caught us with our outfielders talking to friends in the bleachers, and our safety men kicking mud out of their cleats. Thousands of miles of newsprint columns hash over the gossip and fact of Pearl Harbor. Yet in the same marble halls hearings are being held on the atomic bomb and atomic energy, with minor attention and publicity. Yet this is a matter of vital importance that concerns all members of the team, and the folks in the grandstand as well. R. W. W.



Snowstorm

By ETHEL BARNETT DE VITO

Softly all day, all night, it snowed
So lightly that till morning showed
How deep it lay, we did not guess
The strength behind the gentleness.

All day and night the soft snows flew
And, resting, wakened winds that blew
Until we saw, when storms had lifted,
A strange world, rearranged and shifted.

Everything we had known or loved
Was buried, bared, or lightly gloved
With drifts piled deep and patches bared:
A crazy-quilt a white world shared.

Beneath whose odds and ends and seams
It seemed to dream uneasy dreams,
Wish-dreams of smooth-perspectived Spring
To make things right for everything.



The condor on the Colombian emblem holds laurel in its beak, and the shield portrays historic and geographic facts about the republic.



The coat of arms of Venezuela is rich in Nature symbolism; its untamed white horse stands for liberty.



Ecuador also uses the condor on its national emblem, and shows Mt. Chimborazo, one of the outstanding peaks of the Andes, rising more than 20,000 feet.

Nature and United Nations' Emblems

By MARGARET WHITTEMORE

WITH the ending of World War II, the already large number of Nature symbols on the coats of arms of the United Nations was increased by the addition of more countries. Several newcomers were added to the emblematic flora and fauna, and one eagle did an about-face. This was the American eagle on the flag and seal of the President of the United States. Heretofore it had been gazing at arrows clutched in its right talon; now it contemplates an olive branch, the symbol of peace. The eagle on the national coat of arms remains unchanged; it has always faced toward the olive branch.

Much of the Nature symbolism has been contributed by other republics in the Western Hemisphere, since animal and vegetable life have a leading place on their coats of arms. The national emblem of Chile has, as supporters for its shield, a giant condor and a guemal or huemal. The latter is a member of the deer family, found in southern regions of Chile. The



A giant condor, and the guemal or huemal, a native animal of the deer family, support Chile's shield.



The riches of Peru in three kingdoms of Nature are shown on the emblem of that country.

In its issue of November, 1943, Nature Magazine described and pictured the parade of Nature symbols on the coats of arms of the United Nations. Since then other countries have joined the original group in seeking a solution of world problems and the way to peace. The official symbols of these countries are here presented, to bring us up to date.

condor is characterized by the white ruff encircling its unfeathered neck, and the bare caruncled head. The adult plumage is otherwise a uniform black. The condor and guemal are shown on the national emblem wearing on their heads "naval crowns" in recognition of those awarded to sailors in olden times for feats of special bravery. Above the shield is a tuft of red, white and blue plummy feathers. Such plumes were formerly worn as a mark of distinction on the hat of the President of the Republic.

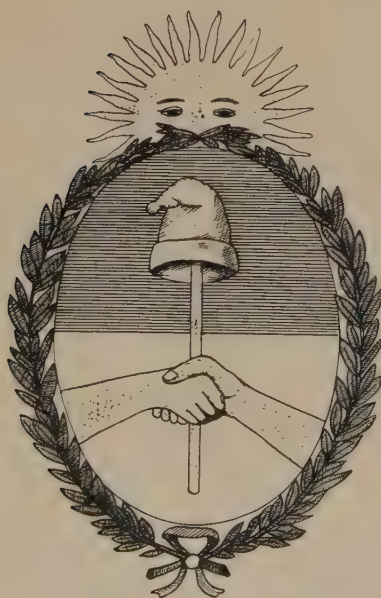
The condor with wings outspread is seen on the arms of both Ecuador and Colombia. In its majestic flight, sometimes 22,000 feet above the sea, this bird seems to sail on the air, scarcely flapping its wings. Colombia's condor holds in its beak a laurel wreath. The shield of Colombia has, in the upper section, a golden pomegranate or "granada," symbolic of New Granada, the name first conferred upon this coastal country by the



Horse for liberty, ox for plenty, scales for justice, and mountain for power, are on Uruguay's shield.



Palm and olive branches surround sea and star on the simple emblem of the Republic of Paraguay.



Intertwined laurel branches, signifying fraternity and union, appear on the emblem of Argentina.



The eagle on the Syrian emblem has on its breast a typical Arabian shield, the stars standing for Damascus, Aleppo and Deir ez Zor.



The old emblem of the Third Republic of France may be supplanted by a new one for the Fourth Republic.

Spaniards. Flanking this symbol are cornucopias overflowing with tropical fruits and golden coins. In the lowest section of the shield the Isthmus of Panama is depicted, with two full-rigged sailing vessels, one on the Pacific Ocean and the other on the Caribbean Sea.

In the oval shield of Ecuador we see Mount Chimborazo, "Mountain of Snow," one of the highest peaks of the Andes. Nowhere in the Andean system do the individual mountains attain so magnificent a development as in Ecuador. Chimborazo is considered to have been volcanic at one time. Its summit rises more than 20,000 feet. Above the mountain the designer of the shield has introduced the sun and four signs of the zodiac—Aries, Taurus, Gemini and Cancer, corresponding to the months of March, April, May and June, all memorable in the history of Ecuador. Surrounding the shield are banners and sprays of palm and laurel.

Palm and laurel branches, indicative of victory and honor, are seen on several national emblems of South America. Two intertwined laurel branches, representing fraternity and union, surround the ellipse of the shield of Argentina, while the sun, emblem of power, rises above.

The coat of arms of Uruguay is similar in design, with a crest formed by the golden sun, and with the oval surrounded by two olive branches. The shield is divided into four quarters, the lower sections picturing a horse running free, symbol of liberty; an ox, symbolic of plenty. In the upper sections are a pair of scales for equality and justice, and the mountain of Montevideo, symbol of power.

Venezuela has a coat of arms rich in Nature's symbolism. Two horns of plenty are overflowing with the fruits of the land. A bundle of wheat stalks indicates unity and fertility of the soil. The untamed white horse symbolizes liberty. Surrounding the shield are palm and laurel branches.

Paraguay chose a seal circular in shape, showing a body of water with blue sky above and a five-pointed red star. Surrounding the circle are palm and olive branches tied together with a red, white and blue ribbon.

The riches of Peru in the three natural kingdoms are symbolized on its coat of arms. The llama, which resembles a small camel minus the hump, is the principal carrier of burdens along the mountain trails. The bark of the cinchona tree, native to Peru, is the source of the quinine of commerce. A cornucopia overflowing with golden coins indicates the mineral wealth. Above the shield is a laurel wreath, with branches of palm and laurel on either side.

Moving back to the Old World, we find the coat of arms of France to be changed. Under the First and Second Republics the coat of arms of France included an eagle as the central feature. Napoleon I also used



The state emblem of the Ukraine bears a marked resemblance to the coat of arms of the USSR.



The palm plays an important part in the lives of Liberians, and appears on their emblem, as does a dove.



Byelorussia partakes of the Soviet symbols, the oak branch signifying wooded country.

the eagle, in upward flight, as symbolic of his soaring career. The official seal of the Third Republic presents a seated woman holding in her right hand the fasces, symbol of power. At her feet is a sheaf of wheat, together with other emblems of industry.

The coat of arms of France has gone through more transformations than, perhaps, that of any other country. The conventional fleur-de-lys has long been associated with the monarchs of France and did not disappear from the flag until the downfall of Louis Philippe in 1848. According to legend, St. Denis personally bestowed the lily upon the royal family as a heraldic device. At the coronation of a king it was customary for the Franks to elevate him upon a shield, and to place in his hand an iris instead of a sceptre. Certain kings had their own personal emblems, such as the salamander of Francis I, rising unscathed from the midst of flames; and the all-over design of dolphins, surrounding the coat of arms of Henry IV. The fleur-de-lys was used centuries before the days of Frankish supremacy, as indicated by ancient carvings and decorations in Egypt, India and Etruria.

The official emblem of Syria consists of an eagle that bears on its breast a typical Arab shield, emblazoned with three stars, representing Damascus, Aleppo, and Deir ez Zor. The legs of the eagle suggest those of a horse, since Syria is noted for its fine Arab horses. Two heads of wheat are introduced because of Syria's importance as an agricultural country.

To the people of Lebanon, the cedar, which figures prominently on the flag and coat of arms, stands for long life, holiness and endurance. During the Middle Ages people made pilgrimages to the Cedars of Lebanon, which flourished in abundance on the sides of Mount Lebanon. Some of the trees were believed to have been planted by King Solomon himself. The once magnificent grove is now only a speck on the mountain side. In 1943 the Republic of Lebanon sent to the United States as a good-will offering twelve living cedars to be planted in Arlington National Cemetery overlooking Washington. These trees were carefully selected from sections of Lebanon where altitude and climate are similar to those of Washington, D. C., rather than from higher altitudes. Cedars from Mount Lebanon were introduced into England about 1650. Some of them are said to be 3500 years old.

The official seal of the Negro Republic of Liberia shows a dove on the wing, carrying an open scroll in its beak. There is a ship in full sail near a stretch of shore, on which is a palm tree, with a plow and spade at its base. The palm plays an important part in the life of the people of Liberia. The best known palms are the borassus or fan palm, the oil



Lebanon's coat of arms is quite simple and features the famous cedar of Lebanon.



Turkey's crescent and star are of ancient and historic meaning as symbols.



Iran adds another lion to the animals that appear on the United Nations' emblems.



Denmark's coat of arms is among the oldest now in use, and its shield is rich in Nature symbolism, representing its several colonies.



Egypt features the crescent and the stars, symbolizing the fact that it was long a part of the Turkish Empire.



Crossed swords for courage, and the palm for life, peace and security, make up the simple coat of arms of Saudi Arabia.

palm, the bamboo palm and another species producing the valuable piassava fiber, which is used for heavy industrial brooms. Bird life in Liberia is varied and includes egrets, herons, ibises, hornbills, eagles, pigeons and wild ducks. The pigmy hippopotamus is found only in Liberia. Many species of the fauna of this country have been pictured on their postage stamps.

Byelorussia and the Ukraine have State emblems bearing a marked resemblance to the coat of arms of the USSR, of which these republics are members. The central feature is the hammer and sickle, symbol of the union of workers and peasants. Forming a circular design are stalks of bearded wheat. In the emblem of Byelorussia, clover blossoms are interspersed among the wheat, and a branch of oak leaves and acorns is used on one side. Forests constitute the most important national wealth of that republic, a portion of which is known as "Polessye," meaning "wooded country." The rich wheat fields of the Ukraine, extending along the southwestern borders of the Soviet Union, were among the principal objectives of the German attack on Russia in 1941. The collective farmers sabotaged, in all possible ways, the German attempts to ship grain and other vegetable products to Germany. They inaugurated the scorched earth policy by burning the grain in the fields.

When Iran entered the fold of the United Nations in 1943, it brought as its national symbol another lion, holding a sword in its right forepaw. Peeping over the back of the king of beasts is a sun, emblem of goodness and purity. Iran was the name given to Persia in 1935. During the reign of Cyrus the Great, the Persians had displayed on their white standard a golden eagle.

The Egyptians had the earliest military organizations, and were probably the first people to use flags

and standards. Both Egypt and Turkey feature on their national insignia the star and crescent. Egypt was a part of the Turkish Empire from 1517 until early in the nineteenth century. The crescent was symbolic of Diana, patroness of Byzantium or Constantinople. When Philip of Macedon laid siege to Byzantium in 339 B.C., the Byzantines, one dark night, were enabled, by the light of a crescent moon, to resist the invaders, who were trying to undermine their walls. The star and crescent device was used on ancient Byzantine coins.

The Dannebrog of Denmark, said to be the oldest national flag still in use, is represented in the center of the coat of arms by a white cross. In 1219 King Waldemar II saw in the heavens a silver cross, which gave him power to save his country at a critical time in its history. He introduced the cross into the design of the flag. The shield of the coat of arms is supported by two savage men, supposed to represent the Cimbrians, who were driven out of Jutland some two thousand years ago by rising floods. In the first quarter are three blue lions and nine red hearts, symbolizing Denmark proper. The Duchy of Slesvig is represented by two blue lions. Three golden crowns on a blue field stand for Sweden, formerly united with Denmark. A silver falcon represents Iceland, and a polar bear stands for Greenland, a colony of Denmark, sixty times larger than the mother country. The Faroe Islands are represented by a silver sheep, in recognition of the major industry of these islands of the North Sea. A blue lion stands for Jutland, and a golden dragon for Vandalia. Other characters in the center of the shield are of historical significance only. Chains suspended underneath the shield represent two orders of knighthood. The Order of Dannebrog is distinguished by a white cross, and the Order of the Elephant by a white ele- (Continued on page 104)

From the Orient to Dixie

By CHARLOTTE HILTON
GREEN

A Chinaberry tree growing beside a shrine in China, and photographed there by the late E. H. Wilson, famed plant explorer. The picture is by courtesy of the Arnold Arboretum, and from the book *Trees of the South* by Mrs. Green.



FROM the Orient to Dixie—that is the migration of the Chinaberry tree so common around cabins and along roadsides in many sections of the South. It is rather a far cry from the tree by the shrine in old Cathay to one on the edge of a remote swamp in the Carolina Low Country, where the immigrant is draped in long, drooping festoons of gray Spanish moss.

No one seems to know when this tree—known to generations in the South as “chaneyberry”—was brought here. Perhaps it came on some slow sailing vessel, or across wide seas on a “fast clipper.” No one seems to know, either, who first introduced it. Perhaps some traveler saw the tree growing by an ancient Chinese temple, or in some lonely, high Himalayan village. Fascinated by its strange leaves and flowers and fruits, he may have brought seeds, or a sapling, home with him.

The tree is native to the Himalayan regions of

India. According to Troup, in *silviculture of Indian Trees*, it has probably been in cultivation since the 16th century, and has long grown in all tropical and subtropical countries. In the Indian mountains it grows at elevations as high as 6000 feet, which is as high as most of the higher mountains in our own southern Appalachians.

Of late years we have been hearing much of the Burma Road. Perhaps some of our soldier boys traveling it—or in other parts of Burma, India and China—might, like Uncle Remus and the chickadee, “meet up with” a Chinaberry. In all those regions it is a favorite, being planted for its handsome flowers and for its shade as a roadside tree.

In China, in particular, it is popular. In fact, were we to sail in a Chinese junk up the famed and treacherous Yangtze River, we would at times see many Chinaberry and crape myrtle trees. If it were not for the pagodas, the exotic people and the queer river



The Chinaberry or “China Tree,” *Melia azedarach*, growing beside a cabin in Mississippi. It is to be seen in many similar locations in the South, where it differs in form from the original tree from China. It is believed to have been a “sport” that fostered the many trees of this species that are found in the United States.

Compound leaf, flower cluster and previous year's fruit of the Chinaberry. What appears to be a spray in the lower, left-hand corner is a single, compound leaf, the end of its stalk, or petiole, being covered by the flowers at the end of the twig.

craft, we might almost think we were on a lazy, tawny river in Dixie.

But the Chinaberries we would see would not be the shape of those commonly found around cabins and farm houses of our own South. Instead, they would be more graceful and slender trees with spreading branches. When it finally dawned upon a certain Carolinian newspaperman, an admirer of this tree, that its oriental form was the familiar "chaneyberry" he wrote: "The thing that fooled me was the shape of the tree. All the Chinaberries I had seen—in people's yards—were low and densely foliated, with stocky trunks and thick, bushy crowns. I had not known that, unclipped, the Chinaberry would soar up and up on a graceful, curved bole to spread its delicate foliage in light, feathery, and semi-pendant sprays. I have decided that man, with his clippers and pruning hooks, has not done right by the Chinaberry tree."

There hangs a tale of interest to the South, and to Texas in particular. It was not man, with his "clippers and pruning hooks," who had changed the shape of this tree, but Nature herself. And she had not done it in China, or in its original home in the Himalayas, or even along the famed Burma Road, but *in Texas!*

The form of this tree most commonly seen in the South, where it is often referred to as the "umbrella tree," actually originated in Texas. It came from what is known botanically as a "sport" of the Chinaberry tree that had been introduced from the Orient. This low-spreading variety—Americanized child of oriental heritage—has the familiar short, umbrella-like crown that gives the tree its common name, especially those around cabins.

It seems to be far more common everywhere than the original form of the tree. One wonders why, because its foliage is thick, and the tree usually grows just about tall enough to shut off most of the air and light from cabins. The original shape of the tree, although less well known in this country, is generally considered to be better and more artistic.

Even in its original form the Chinaberry is not a large tree. It seldom attains more than forty or fifty feet in height, often much less. In whatever form it grows, the trunk is usually short, and the dark gray



PHOTOGRAPH BY SAM A. GRIMES FROM "TREES OF THE SOUTH"

bark is marked with shallow, longitudinal furrows. No particular use of the wood has ever been made here, but in the Orient it is used to some extent for cabinet work. Since the tree belongs to the Meliaceae, which is the mahogany family, it may be that we have been overlooking an opportunity.

Leaves of the Chinaberry have sometimes been called the most beautiful of all tree leaves. To the uninitiated in tree lore, a single leaf of it might be taken for a graceful spray, for the leaf is compound—twice-, or sometimes thrice-compound, with numerous dainty leaflets. The margins of the leaflets are toothed, and the terminal leaflets are often lobed. In summer the leaves are a lovely cool green; in autumn they turn pale yellow and fall early.

In the upper South, the exquisite flowers, which are also unusual, appear in late April or May. Pale lavender-blue or purplish, hanging in clusters, they are rather fragrant. Coming out after the leaves are well grown, the loose clusters are half hidden in the green foliage, and leaves and flowers together are a delicate, living mosaic of rippling green and amethyst.

Pale yellow drupes, more commonly referred to as berries, form the fruits, which hang in loose clusters and remain on the trees. At first they are smooth, be-

coming wrinkled and persisting throughout the winter and often remaining into the spring. A few of them remain even through the second summer.

Chinaberries are not very popular with the birds, a few species feeding on the berries, but usually only when food is scarce. Seldom, if ever, are great flocks seen feasting on them, as they often do on the berries of holly, dogwood and cedar. Even in severe winters, when food is difficult to obtain, the Chinaberry Bird Cafeteria may still be offering its wares. Robins probably feed on these drupes more than other birds. Sometimes, apparently, they "get on a jag" from eating too many. Sometimes squirrels may be seen busily plucking and splitting open the fruits, eating the seeds and letting the husks fall.

To humans these berries are considered poisonous, yet they are occasionally used in China as a fever medicine and disinfectant, and, in the past at least, as a medicine to expel worms from cattle. Also, Chinese make incisions just under the bark, collecting the sap for use as a cooling beverage.

In some of the southeastern countries of Europe, the hard, ridged stone of the seed is cleaned and used in making rosaries. Thus, a far-flung tree, that may offer shade and rest for Orientals near some Chinese temple or roadside shrine, may also provide a rosary with which a Catholic in Europe may bow his head and "tell his beads" by some wayside shrine.

And could the Chinaberry also be a mystery tree? At least the one photographed by the Chinese shrine

has been to me. This particular photograph was taken by the world-famed plant explorer, Dr. E. H. Wilson, who spent many years in the Orient, especially in western China, collecting plants, particularly new species, for introduction to the western world. There are no clusters of berries on the tree in the picture. I have often wondered why. No botanist or tree expert I have discussed it with has been able to say, and, unfortunately, Dr. Wilson is no longer living.

Even in India, according to Troup, the fruits remain on the trees until the following season. It may be, a famous southern botanist suggested, that this particular tree had the peculiar characteristic of shedding its berries early. That may be the answer, but it deepens the mystery. This photograph was one from a collection at the Arnold Arboretum, and, a few years ago, the staff graciously let me go through their files of tree photographs again. In the other two photographs of this tree in China, taken when the leaves were gone, there were also no berries!

The Chinaberry is not popular with the birds as a nesting tree. Perhaps the crotches and branches are not pleasing to winged homebuilders. I have observed these trees when bare in winter and, in many thousand trees, I have seen few nests. Yes, it is a queer and mysterious tree, the Chinaberry, but, whether growing on a Himalayan mountainside, beside a Chinese temple, along the Burma Road, in a Siam garden, or by a cabin in Dixie, it holds one's interest.

The "An" in "Animal"

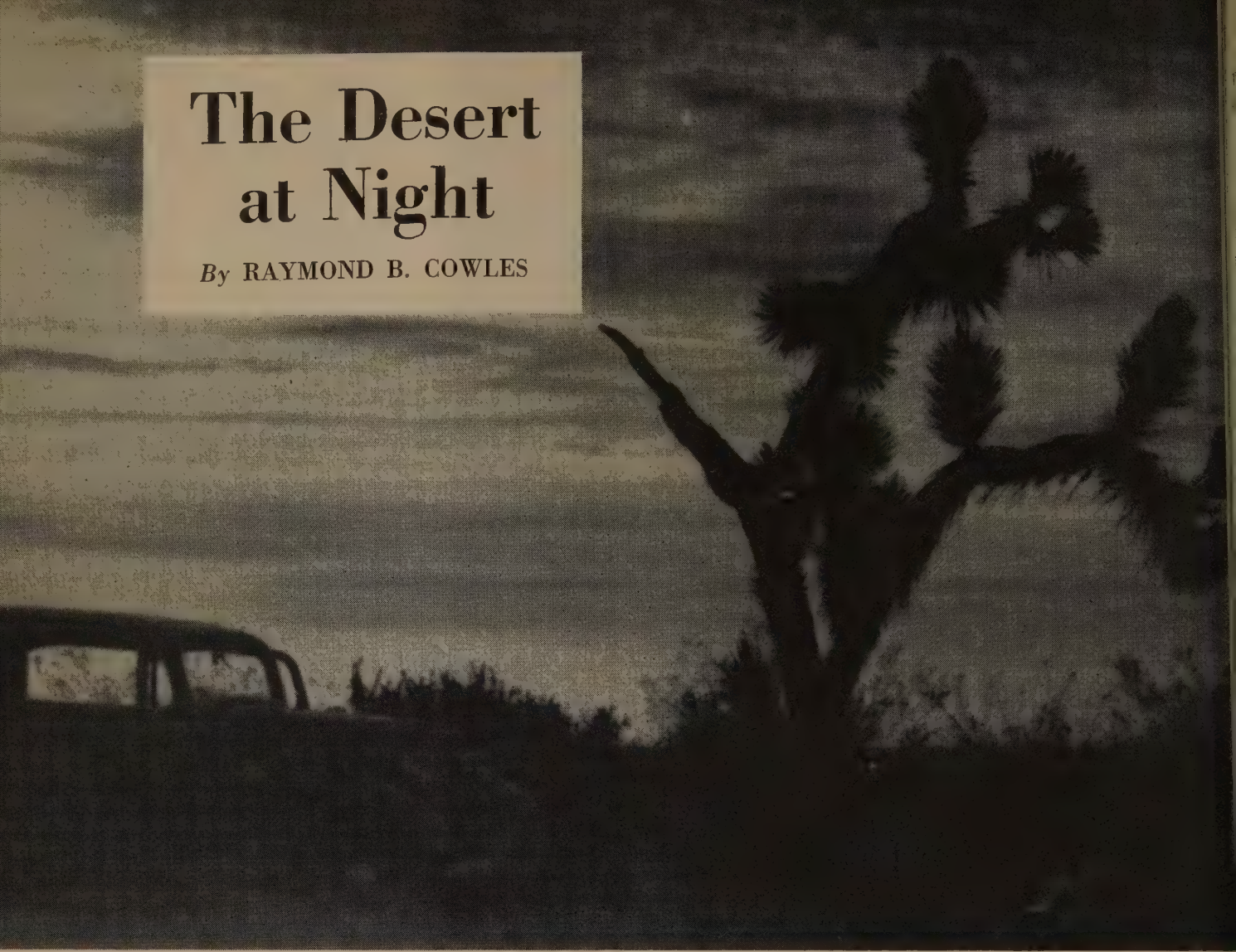
By REY F. HEAGY

THERE are twenty-six terms for individuals of different groups of animals, all of these words ending in "an." For example, and to give you a start, bees belong to the Order Hymenoptera, which includes wasps, ants, ichneumons, sawflies and others. Thus, a bee is an hymenopteran, and 16 on the list is associated with (f). See whether you can find the proper associations for the other twenty-five listed below. Fifteen correct would be good, and twenty excellent. After you have done your best, look on page 104 for the answers.

- | | | | |
|-----------------|-----------------|------------------|-----------------|
| 1. amphibian | (a) snail | 14. gastropodan | (n) silver-fish |
| 2. annelidian | (b) grasshopper | 15. hemipteran | (o) lizard |
| 3. apteran | (c) whale | 16. hymenopteran | (p) turtle |
| 4. arichnidan | (d) elephant | 17. lacertilian | (q) octopus |
| 5. asteroidean | (e) flatworm | 18. lepidopteran | (r) sponge |
| 6. cephalopodan | (f) bee | 19. metatherian | (s) lobster |
| 7. cetacean | (g) spider | 20. ophidian | (t) bat |
| 8. chelonian | (h) alligator | 21. orthopteran | (u) fly |
| 9. chiropteran | (i) frog | 22. pinnipedian | (v) seal |
| 10. colopteran | (j) butterfly | 23. poriferan | (w) opossum |
| 11. crocodilian | (k) earthworm | 24. proboscidian | (x) beetle |
| 12. crustacean | (l) sea-cow | 25. sirenian | (y) starfish |
| 13. dipteran | (m) aphid | 26. turbellarian | (z) snake |

The Desert at Night

By RAYMOND B. COWLES



RUNNING, leaping, burrowing, creeping over the floor of the vast inland desert valleys of the Southwest, are the relics of a hundred million years ago. They are the aristocrats among the back-boned animals, if aristocracy be judged only by antiquity of lineage. Compared to these animals, the occupants of the motorized juggernauts that flow in ceaseless streams across our country are mere parvenues.

These relics of a bygone age are the reptiles. They range from the tiny gecko, a green-gold and black lizard with a squeaky voice and heavy-lidded, jewelled eyes, to the dust-colored giants of the desert reptile world, the dangerous and sullen-looking diamond-back rattler, voiceless save for its buzzing rattle and deaf to even its own dubious music.

Before the war, and now once more, hurrying cars bore thousands of passengers to the desert every spring and winter week-end. Among these were always a small minority of vehicles carrying odd assortments of human beings, devotees of reptile study. This curious group included the vice-president of a large and flourishing corporation, the well-known curator of a zoo, college professors, students, high

school teachers and their pupils. In addition to these, there were the non-scientific seekers for thrills, the merely inquisitive, and professional reptile collectors eking out a precarious livelihood, and men with the big-game-hunter complex seeking danger in this gameless modern world by pursuit of the puny but venomous rattlers.

Among the scientists the shop talk is cryptic. Their discussions are interlarded with scientific names, references to LORs and DORs (Live on Road and Dead on Road, i.e., traffic survivors and traffic fatalities), weather forecasts, radiation and convection, humidity, wind velocities and standard deviation of error. Most of these experts are primarily concerned, in one way or another, with the biological secrets still locked in the slowly pulsating, scaly breasts of these uncommunicative beasts.

Millions of years have elapsed since the "age of reptiles," yet the presence of these living relics poses many questions of survival based on habits, physiology, climate, and topography. These and other questions must be answered, and thus contribute to the knowledge of the whence and whither of other forms of life; of the life histories of all animals.

The collared lizards flourish on the rocky, boulder-strewn slopes of the mountains in the desert country, relics of the age of reptiles.

Collecting reptiles is no simple matter. Only in the memory and in the fertile brains of the uninformed are reptiles really common. Many specialized techniques have been developed to make their discovery more certain and their capture less time consuming. Weather, geography and vegetation play their part in selecting the time and place for trips, and, even so, the experts all too often draw complete blanks.

One of the most popular routes of exploration passes through mile on mile of citrus groves, vineyards, walnut and peach orchards, past a giant cement works and a steel foundry. The route passes the country of Ramona, reaches the pine forests, then on toward the desert goal, through valleys lying in the shadows of mighty San Jacinto peak.

On such a trip we passed from forest to chaparral, and then to miles of rock-studded slopes. There the chamise, with russet trunks and dense tufts of vivid green, needle-like foliage, gave way to the vanguards of the desert, dagger-clothed yucca, spire-stemmed agave and discouraged looking *Nolina*. Rounding a bend in the highway, we frightened a desert bobcat from its meal on a still-writhing rattlesnake. This wild hunter had elected to eat its victim head end first.

Around us towered pine-clad mountains, but beside the road great, naked granite outcrops bore on their highest pinnacles small and active lizards, soaking up the late afternoon sunshine. These were dusky blue-black in the distance, and our cleverest wiles of stalking failed to reward us with a single specimen. George, despairing, resorted to his "22" rifle and soon "barked" a wary male by smashing a bullet under his chin. The lizard, only stunned, struggled violently, pricking our skin with its needle-like scales, but, like all lizards except the Gila Monster, it could do no great damage. Bright blue in any lizard is a guarantee of harmlessness. These dark-hued little reptiles, the wariest of our western species, reward the col-



lector with one of the most gorgeous reptilian displays of turquoise, violet, purple and electric green in iridescent speckles and massed blotches.

Satisfied with only one of these sentinel lizards, we coasted desertward. Hills grew more barren, trees shrank to bushes, and the bushes to shrubs, while the gaunt piles of reddish granite rock grew ever more naked. Puffs of hot air became hotter and stronger, floating invisibly up the cliffs and canyons, finally merging into a steady wind that rose, dry and searing, from the sun-baked flats below.

In this Dantean world we found our first chuckawalla, a wrinkled, scaly patriarch basking in the last



Down on the desert plains the desert iguanas, or northern crested lizards, seek refuge underground as soon as dusk begins to fall. The collector and student of the reptile life of the arid lands must know these habits and where to find his quarry.



Every animal that crosses them leaves its imprint on the dusty desert roads. From these the student of desert life may read many stories of the struggle for existence.

hot red rays of the sun. It was perched on a weather-worn knob of rock, looking outward and downward three thousand feet to the shimmering white desert valley floor and the purple pool of bitter Salton Sea.

As we stalked him on his eminence, it was clear that he recognized his enemies. He sidled to the farther edge of the ridge, crept beneath and between huge flakes of exfoliating granite, and there came to rest and inflated his scaly flanks.

This strategy probably works with all but human beings. The Indians are reputed to have punctured the bodies of these lizards with sharpened sticks, and, having deflated them, dragged them out of hiding to add these largest of California lizards to a meager larder.

Our search was not for food, however, and we solved the problem with crowbar and back-breaking lifting. In a few minutes the patriarch was extracted from a widened crevice. This is healthy work, and good for the waist line, but caution is needed. Rocks may slip from a crowbar point and pinion the would-be captor. A man should work with someone else. Even one day spent pinioned in full sun with no water might avenge the chuckawalla tribe.

By the time we had finished prying and wrestling the second captive from his lair, the sun was setting behind the towering San Jacinto. To the westward, the sun still blazed through the San Gorgonio pass, throwing a gigantic spotlight across the lesser hills, lighting the Little San Bernardinos with an other-worldly flood of crimson light. Around us the mountain-shaded foothills and canyons faded to purple and

violet mistiness. It was a scene of surpassing beauty.

We sat spellbound until the sunlight dimmed and disappeared, melting away as though at the bidding of a supernatural power. With the fading of the light, the last day-time sounds ended. The silence of eternity swept over mountain and desert, relieved only by the rush of hot air whispering through the wiry bushes, bearing the heat-distilled essences of a thousand aromatic plants.

It was obvious that the day had been unusually hot in the deserts below us. Temperatures would be above the ninety degrees that seem to set the upward limits for collecting. So we took time off for a cooked dinner, usually a luxury, since much of the best collecting comes in late afternoon and early evening. Dinner is ordinarily a sandwich and coffee, designed merely to stay the pangs of hunger until midnight.

We kindled a fire of desert brushwood, and the super-desiccated but oily twigs blazed up at the first touch of a match, distilling from their essences a heavenly blend of pungent aromatic fragrance. Over the tiny fire we broiled cubes of tender steak, and, having eaten, plunged the broiling rods through the sterile desert sand to clean them. With this single move our only utensils were washed!

We paused a moment after the meal, watching the small glow of the fire, a single spot of light in the overwhelming shadows of the mountain. We felt the silence of a deadened world. The wind had died, and even falling ashes gave forth an audible rustle. We heard the faint high squeaks of a solitary wheeling bat. From the mighty jumble of rocks in the canyon



The gullied desert hills support scanty vegetation, but on the alluvial fans below the hardy plants put forth abundant bloom and desert animal life abounds.

below us an insomniac rock-wren warbled a few notes. In the accentuated silence we heard our own thumping heart beats.

With the falling of night the hot, buoyant air lost force. The first puff of cool, down-canyon wind rustled the dead leaves as we coasted the car out on the pavement and started the drop toward the desert three thousand feet below. This was the famous Palms-to-Pines highway, a twisting sinuous road, hewn from the granite bones of the mountain.

Thirty minutes later, our ears cracking from released pressure, we rolled from the last curve and sped in a long, extended glide toward the distant shadows of the desert date gardens, and the sandy ground where we felt sure we would find our first night catch.

As the evening search started, the afterglow of the sun painted the cloudless sky with a wash of many colors, from orange-red to deep blue in the zenith. The distant mountain ranges stood vertically against this back-drop, without mass or perspective, looking like blue-black velvet silhouettes stretching along the horizon to infinity.

There is an unreality and unbelievable enchantment in this ultra-simplified world. There is an overwhelming temptation to relinquish the business of the evening and quietly absorb the beauty of an unreal scene.

As darkness blots the sky, eyes return to the search for reptiles. Sooner or later, a thin white line, or a

darting shadow outlined against the pavement, betrays the presence of a snake or lizard. These protectively colored desert animals, products of natural selection covering millions of years, melt into their background so effectively that it is only their light-reflecting undersides, or the shadow cast beyond them, that reveal their presence at a distance.

The amount of desert animal life during the hours of night driving is a revelation to the uninitiated. Only the desert devotees, and not all of them, know how to see and where to look for proof that to desert animals their environment is not hostile; that they thrive better in their harsh-appearing homeland, which habit has softened for them, than they would in the blander coastal areas.

Scorpions, wind-spiders known to the Mexicans as vinagaroons, walking-stick insects, praying mantids, grasshoppers, and legions of lesser folk often lead an inexperienced reptile collector, and certainly a biologist, to stop the car and spend valuable moments watching some of the lesser wonders of these "barren" wastes. At long intervals, glimpses of coyotes, foxes, and, rarely, bobcats, relieve the tedium of night driving. But it is a rare night when long-eared, long-legged jackrabbits, or cottontails, scurrying little bundles of fur, do not require quick hands on the steering wheel to escape a tragedy. Big, pastel-colored kangaroo rats waltz back and forth across the pavement, or, dazzled by the lights, leap aimlessly in the middle of the road, only to (Continued on page 104)

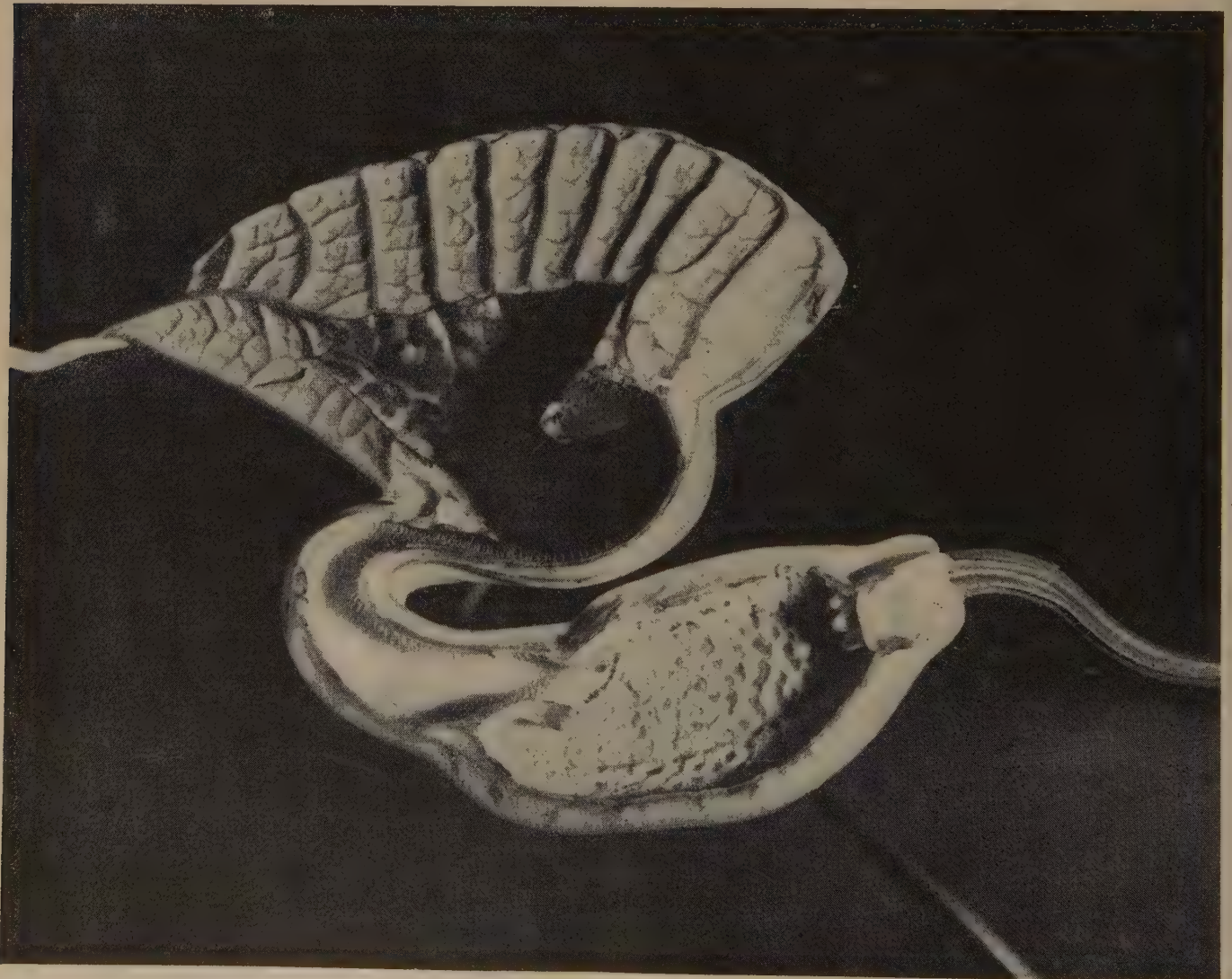
Aristolochia— Booby Trap for Insects

By LEWIS WAYNE WALKER

Photographs by the Author

AMERICAN men and women who saw wartime service in tropic and sub-tropic areas encountered many strange plants. One of these was *Aristolochia*, a booby trap and temporary prison for in-

At the left, a three-quarter view of one of the tropical species of *Aristolochia*, or birthwort, showing an unopened pipe below. In the picture below is a cut-open cross-section of this floral booby trap. Insects enter the part of the flower at the top, lured by an odor like that of decaying meat, passing the hairs that let them into the bulb-like upper part of the bloom. Later in the day, when the flower wilts, most of the insects are released.



sects. It is one of a genus of plants including some two hundred species, most of which are found in the warmer regions.

Perhaps the best known species is the vine known as Dutchman's pipe, *A. macrophylla*, which takes its popular name from the shape of its inconspicuous flowers. In contrast, the tropical species may have giant blossoms, five inches across and with an over-all length of eighteen inches. The popular name for the genus is birthwort. Its scientific name comes from the Greek and indicates a supposed medicinal value, since it means something best for use in childbirth.

Most of the tropical birthworts are perennial woody climbers and twiners. Many species are evergreen, and they are often found cultivated under glass in greenhouses and botanic gardens. To the service people in the tropics, these vines, throughout most of the year, suggest morning glories as they climb over the branches of tropical trees, or, occasionally, ramble over the ground. At the ends of the limber side shoots, a peculiar twisted bulb is to be seen. A few inches above this bulb an odd leaf growth entirely circles the stem and, in miniature, resembles the rat guard on a ship's hawser.

As this odd plant grows, the pendant bulb takes on the shape of a curved smoking pipe, the bowl of which is compressed to a vertical sharp edge. During this period tiny hairs and narrow tubes, hidden within, are attaining a definite pattern. Then comes the day of blooming. The sharp-edged prow splits open, revealing a mottled design of chestnut and green. It is a bloom alluring to the sight, but revolting to the nose. From deep within the stem comes an odor like that of decaying meat. The breeze wafts this around, and a person familiar with the odor can locate the blooms from a score of feet away by the simple expedient of "following his nose."

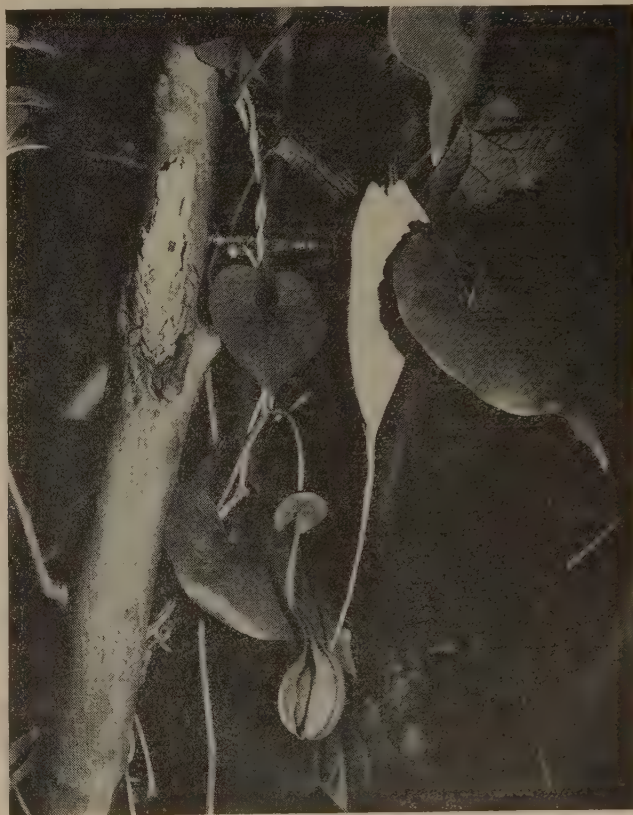
Flies, gnats, and other insects that usually feed on decayed matter flock to the open portal. Without hesitation they forge up and into the apparent banquet, so freely advertised on the wind. They push by row upon row of hairs, which bend and admit them. They jump or fly off the edge of a funnel that protrudes into a bulbous sack. Their sense of smell tells them that there is food aplenty, but there is none.

For eight or ten hours they struggle around, seeking the source of the smell that pervades the chamber and was so alluring from outside. The flower's pollen, picked up on feet and wings, is deposited where it will do the most good. The hairs that bent so readily when the insect entered now stand like rigid traffic cops on a one-way street.

In the late afternoon, when the bulb is packed to capacity, and the hum of the wings of thousands of trapped insects can be heard from outside, the flower starts to wilt. Hairs that blocked the exit droop. The baffling funnel becomes limber and collapses, and the odor disappears. Thus the insects, their function performed, are released to go their ways.



Face-on view of the opened bloom of the *Aristolochia* vine. This shows the entrance to the flower that is used by insects as they succumb to the lure of the plant's odor. The pipe-like remainder of the bloom is concealed behind this, but an unopened flower is seen at the lower right of the picture. Below is a picture of another unopened bloom, and, lower center, a seed pod of the birthwort.



How Green Will Your Garden Be?

By ANDREW S. WING

WHAT to grow in 1946 is a question being pondered by many a home gardener in this first peacetime season in five years. Having battled with spray gun and hoe for four years to help win one of the most astounding home-front victories of all times, he is no longer faced with an urgent patriotic need for all-out home food production. This year he can relax a bit and grow what he likes, or put away the shovel and the hoe, if he chooses, in favor of the niblick or the camera.

However, most of us who have green thumbs, or think we have, will keep on digging. Many of the eight or ten million Victory Gardeners had their first taste of home-grown vegetables during the war. They will keep it up because they now know how good "garden-fresh" vegetables can be. Corn that is sped from row to pot, or tomatoes with the warmth of the sun still in them, or snap beans that really snap are something special.

Also, we must not forget the millions of starving and undernourished people who must be fed with our help. For this we need to grow a surplus. The \$3,300,000,000 worth of vegetables grown by Victory Gardeners in four war years was a contribution to the war effort that is unparalleled in the history of this or any other nation. And there are those who believe that, if home gardeners should suddenly let down, we could easily run into serious food shortages in this country this year.

Taking the long view, M. L. Wilson, Director of the Extension Service of the U. S. Department of Agriculture, has expressed a hope that the great impetus that gardening gained during the war will not be lost. In gardening he sees spiritual as well as physical benefits we need as a nation. With our feet rooted in the soil of our ancestors, we can attain and enjoy "the more abundant life." And we can help to create that right in our own dooryards, without legislation or subsidy, if we so choose to do.

In Nashville, Tennessee, lives a plain American



Jim Brown of Nashville, Tennessee, winner of the 1945 grand national award in the Green Thumb Contest of the National Victory Garden Institute. With his assistant gardener he inspects some of the produce of his 100- by 150-foot plot, which keeps him virtually self-sufficient the year around, with some left over for friends, neighbors and relatives.

whom I admire, and even envy a bit. I almost feel that he is a friend, although we have never met. I know him only through reading what he put in his garden record for 1945, a record entered in the National Green Thumb Contest. His name is Jim Brown (not James but just plain Jim) and he works five and a half days a week as a clerk in a railroad office. His pay envelope is not too fat, but that does not particularly bother Mr. and Mrs. Jim Brown, because they are practically self-sufficient on their little, one-acre homestead in the outskirts of the city. In the seven years since the Browns bought their place they have never bought a vegetable from a store, except a few Irish potatoes. Last season they grew enough of everything, including both Irish and sweet potatoes, to last them the year around. In addition to a lusty vegetable garden, 100 by 150 feet, the Browns keep a cow and chickens. They also have a smoke

house, a greenhouse, fruit trees and all kinds of berries, grape vines, about everything, in fact, that one can grow in that climate. Besides all their edible plants, they grew, in 1945, more than fifty kinds of flowers. They have more than a hundred urns, pots and window boxes filled with interesting plants, including an orange tree that bears. These they winter over in their greenhouse.

The Browns harvested a bumper crop in 1945. It included fifty bushels of tomatoes, eleven bushels of potatoes, and thousands of pounds of other vegetables and fruits. They canned 576 quarts of fruits and vegetables; dried a lot of things; stored thirty bushels of roots and 300 pounds of cabbage in pits for the winter. Surplus vegetables and fruits and canned goods were distributed to more than a hundred relatives and friends. Not an ounce was sold. Jim says he is "too busy working on the place and in the office to sell produce."

Jim Brown's garden has earned more than \$300, in local and state prizes, in the past two years, as well as two silver medals and a lot of blue ribbons. Recently he was awarded the grand national prize by the National Victory Garden Institute—a \$1000 Victory Bond—for being the top home gardener in the United States.

It is likely, however, that the Browns would be about as happy if they never won any honors. Their sincere love for their little place and everything about it is enough satisfaction. With a home free of debt, and a small cottage on the lot from which they receive rent of \$26 a month, they are mighty independent. In fact, they enjoy more real independence than many business executives whose big salaries are whacked at by high rents, income taxes, and high living costs. Mrs. Brown also loves gardening and spends many hours working with her husband outdoors. Even their three-year-old daughter is learning how to garden. In ten months, in 1945, the Browns spent 1200 hours in the garden; almost thirty hours a week. In his garden record book Jim Brown has written this eloquent paragraph as part of a "Garden Prayer":

"We know that a garden is a beautiful, sacred place since the days of long ago. Even Thy Son went into the Garden of Gethsemane to offer prayers to Thee.

"By trusting in Thee we know that our labors are not in vain and that our harvest is great."

Not all of us can, or would care to, be

Jim Browns, but we can share his pleasure in gardening and his faith in the soil. We can easily be more self-sufficient than we are by growing more of our own food. We can have fun doing it, and without putting in as many hours in the garden as the Browns do. Indeed, many Victory Gardeners whose records I have seen made very creditable gardens by working less than a hundred hours a season. Jim Brown spades his large garden by hand. A plowman could do it much more quickly, and in a garden of that size a small garden tractor would probably pay. A wheel hoe will save many hours and much stooping in a garden of any size.

Most home owners are aware that their lawns and gardens are badly in need of a face-lifting. Because of the pressure of war work, the shortage of help and materials, as well as the need for food gardens, our grass plots, borders, hedges and trees have been neg-

With emphasis placed on vegetable gardens during the war years, many home owners have had to let decorative planting wait. This year will be the time to spruce up home grounds.



If the rock garden has suffered neglect and not enjoyed the solicitous care needed during the years of war, many gardeners will this year introduce new plant dwellers, clean out aliens and beautify the pool.

lected to a point where serious attention is necessary. Where lawns are thin or deteriorated, fertilization, remaking, new seed and in some cases new top soil are needed. Many shade trees have grown too large, or are full of dead and diseased wood. Pruning will cure this condition if the tree is worth saving, but often the axe may be needed. Privet hedges are often improved by cutting back severely, or by filling in the gaps with new plants.

Feeding with a good commercial plant food, manure or compost will work wonders in restoring the health and beauty of neglected plants, if they are not too far gone from disease or malnutrition. Judgment must be exercised in the use of commercial fertilizer, particularly around evergreens and rock plants, which resent strong chemicals. Manure that is well decomposed, or compost, is safe to use almost anywhere. But do not put barnyard manure on your lawn, unless it has been composted, or you will reap a fine new crop of weeds. Dried sheep or cow manure, while more expensive than most fertilizers per unit of plant food, is useful on lawns.

Feed your plants if you want them to be healthy and beautiful. That applies to shade and fruit trees as well as to the smaller sorts. If in doubt as what to use, and how, consult a good garden handbook, your local garden experts, or your seed-store man. By all means start a compost heap, if you do not have one already, and build up a store of home-grown humus. However, if you want results this season it is better to buy some fertility this spring. It will be at least a year before a compost pile will be ready to help you. Anyway, if your fertility is badly run down you will need to put back some of the mineral elements, such as nitrogen, potassium and phosphorus, from commercial sources.

In addition to the basic matter of plant food and hygiene, every garden needs a little dressing up now and then. The addition of a few flowering shrubs, a new rose bush or two, some vines on the house or garage, a few new evergreens, or some of the lovelier hardy plants, such as irises, peonies, phlox, daffodils, or a good planting of annuals, will work wonders. Everyone and everything look jaded at this time of year in the North. As spring rolls around spruce up the old place by giving it a bit of loving care and attention. Every garden is different. Look your place over with a critical eye; have a family consultation; do not be afraid to let your imagination go. If you need help, get some of the new seed or nursery catalogs, or some books on landscaping. They will give you more ideas than you can put to work in a single sea-



son. Make a planting plan on a heavy sheet of paper. You do not need to do everything the first year, but put your ideas down on paper anyway.

If your temperament inclines toward community improvement, there is plenty of good work to be done with our parks, playgrounds, schools, churches and other public grounds. Unless your town is exceptional, there is need for a lot of municipal face-lifting. The vacant lots that were cleaned up for Victory Gardens should be planted to lawns, to flowers, or, at least, kept tidy. Many blighted areas need to be restored, and often these can be transformed into spots of rest and beauty by making them into playgrounds, swimming pools, bird sanctuaries or shady groves. Often all that is needed is someone to start the ball rolling. That could be YOU.

Some years ago I was put on a committee to try to beautify the railroad station in the Connecticut town where I lived. The railroad was willing but broke. We had only about \$50, enough to make a start. Nurserymen generously gave us nice things at wholesale prices, including trees, evergreens, climbing roses and flowering shrubs. People with estates gave us surplus trees and plants. Somehow we got it all planted and most of the things grew beautifully. The garden club took over and has appropriated a small sum of money annually for maintenance and new material. Now, every spring, the giant forsythia bushes burst into glorious golden bloom, followed by dogwoods and roses that hide the fence railings. I swell with pride because of the small part I had in transforming that ugly little station into one of the most beautiful spots along the New Haven Railroad. All it took was a little imagination, some hard work, and a small annual appropriation over a period of a dozen years.

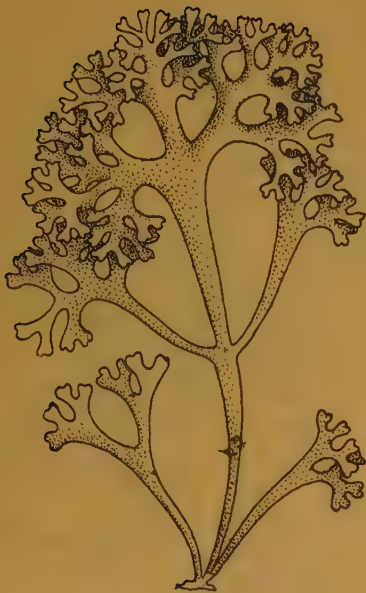
Or, perhaps, you are more interested in children. Inspiring work has been done during the war in teaching children character, science and good citizenship through gardening. You do not have to grow vegetables to instill a love of plants and a knowledge of growing things into the (Continued on page 103)

*This is the thirty-eighth in
Nature Magazine's series of
educational inserts.*

Marine Algae, or "Seaweed"

By E. LAURENCE PALMER

Illustrated by Elizabeth Burckmyer



IRISH MOSS



CHENILLE-WEED



LAVER



DULSE

MY first-hand experience with marine algae dates back almost thirty-two years to a day from the time this will appear in print. I had just taken over the botany work at Iowa State Teachers College, and among the first things I found there was a beautiful collection of marine algae, donated by someone and wholly unclassified. The collection so interested me that I remember giving up two whole days of my first vacation to name and arrange the collection, with the help of literature from a university library. There was nothing worthy of the name in the college library.

So interested did I become in these beautiful plants, the like of which I had never seen in Nature, that I made up my mind that some day I would know them better, and some day I would write an article that would help others get some idea of their worth. I married a Ph.D. beachcomber, who, for more than twenty years, has made me happy combing the beaches of our coasts from Canada to Mexico, on both oceans, and on Cuba, Hawaii, Jamaica and other areas. And while I have lugged heavy and smelly shells for her, I have also surreptitiously learned much of the real plants whose dried representatives so strongly gripped my interest late in 1913.

It is high time that I write the article I promised myself, because interest in marine algae is increasing tremendously, and there is little popular literature on the subject. In 1940, there was a single factory in the United States making one of the products of marine algae and producing, in that year, only 24,000 pounds. In 1945, there were four factories producing more than 200,000 pounds of the same substance. That alone should challenge the interest of



POLYSIPHONIA



FAN KELP



PHYLLOPHORA



BATTERS



HENWARE

some readers. In normal times, Europe harvested some 400,000 tons of green seaweed, from which it got 175 tons of iodine, 10,000 tons of potassium salts, 3000 tons of crude salt, and 7000 tons of crude washing soda. On the other side of the globe, in Japan, seaweed culture had reached such a point that nearly a thousand acres of suitable water had been set aside for seaweed production, and the returns from this area had arisen from \$156 an acre in 1901 to \$300 an acre in 1938. The financial value of two standardized seaweed products in the United States in 1941 exceeded two million dollars at a time when the industry was operating on a much smaller scale than at present. The Chinese merchants of Hawaii alone imported, in one year, some 70,000 pounds of one seaweed product worth \$12,000 before the war. So, from an economic basis alone, and on an international scale, the seaweed business is something on which the average citizen should be reasonably well informed. If we are going to force the Japanese, who are unquestionably ingenious, to live on four main islands, we may expect them to develop seaweed culture to a previously unimagined degree, if they are to survive. And whether we like them or not, we know that they are versatile and persistent. Who knows what their investigations may bring to light?

With the development of a new industry based on a previously undeveloped natural resource we may find ourselves face to face with some new conservation problems. A few generations ago we were told that the soil of the mid-West was inexhaustible; that the forests of the North would always yield in great abundance; that salmon from the Columbia would always be a major asset of the Northwest.

Now, we are told of marine jungles that have not been touched, and that are so immense that they, too, are inexhaustible. But we know that they are confined to relatively limited areas where the depth and bottom are suitable, and we know practically nothing of the role they play in supplying basic food for many standard marine resources. What effect would the destruction of great seaweed beds have on fish, on seals, and on other marine resources? We do not know, because we have never had to face any such problem. We will have to face it in the relatively near future. These assets grow for the most part in areas at least partially remote from regions controlled by particular nations. Who is to say what nation shall have the right to harvest the resources, and who is to supervise the harvest so that a continued yield may be maintained? This may fall in the realm of politics, or of social science, but it will be real, nevertheless, and intelligent judgments can be passed only by those well informed on the facts. Since no one knows all the facts, we have a challenge to the research scientist, the teacher, the industrialist, and the politician or statesman.

But you may say that you are "too small punkins" to be interested in the great



GULF WEED



ROCKWEED



BLADDER WRACK



CEYLON MOSS

our coastline. The gentleman who ordered agar from the prescription counter (there really is one in this drug store) got a material extracted from seaweed. This agar has the ability to take up water and is not particularly digestible so it serves the purpose of lubricating an obstreperous alimentary canal without interfering with the diet. The little flags over the soda fountain counter may well have been "sized" with a gelatin from seaweeds. So, taking all things into consideration, seaweeds do play a rather important part in our lives.

We might go on and list a few of the other every-day things we use or see or do that depend on seaweeds. My son once dropped a jack-knife into some hot water and was surprised to see its hard handle melt quickly into a jelly. This was because the handle was nothing more than a seaweed gelatin that melts at a relatively low temperature, but is hard and attractive at ordinary temperatures. Combs, some buttons, and a host of other commonplace things are made of seaweed gelatins.

One field of human interest that creates a demand for seaweeds is that associated with food. We like foods that look right. Soggy things do (Continued on page 88)

financial and international aspects of such a problem. Let us see if that is quite true. My most recent personal experience with marine algae dated to a few minutes before I began writing this article. It is a hot day and to clear the decks before beginning to write I dropped in at my favorite drug-store soda fountain with my head spinning as to how I should begin the article. As usual, I ordered a chocolate malted milk in spite of the fact that a young man to my right seemed to be enjoying a rather droopy looking cone of ice cream. On my left was a young lady looking into the mirror while she "fixed up her mouth" following her soda fountain spree. Down the aisle a few feet away, I heard a customer at the small prescription counter ask for some agar. And draped over the mirror behind the counter were some American flags, so well "sized" that they stuck out straight from their sticks, in spite of the fact that there was no wind to hold them in that position. I tell you this because every one of those observations was possibly associated with some seaweed, and I have mentioned only a few of the many relationships I recognized.

The chocolate in my malted milk did not settle immediately to the bottom of my glass because a colloidal substance from a seaweed was mixed in it and kept the chocolate in suspension until I had time to drink it. The ice-cream next to me did not melt on this hot day because mixed in it was a gelatin that might well have come from a seaweed. The lady who "fixed her mouth" after her soda may well have been using a rouge made from the seaweed *Dilsea*. In fact, a general name for cosmetics in England is "fucus," which happens to be the generic name for the common bladder wrack of so much of



TENGUSA



VINE KELP



RIBBON KELP

COMMON NAME SCIENTIFIC NAME	SEA LETTUCE <i>Ulva lactuca</i>	SEA COLANDERS <i>Agarum cribrorum</i>	RIBBON KELP SEA-OTTER CABBAGE <i>Nereocystis lutea</i>	GIANT KELP VINE KELP <i>Macrocystis pyrifera</i>
DESCRIPTION	Length: to over 2 feet. Width: to over 6 inches. Broad, thin, with lobed, folded edges and thickest at base. Attached with inconspicuous holdfast. Bright green. Highly variable in shape, with related <i>U. latissima</i> , appearing as floating pale green sheets to 10 feet long and nearly as broad.	Blade: to over 9 feet long and 1 foot wide, abundantly perforated, heart-shaped at base when mature and with a medium midrib to 1½ inches wide at the base. Stalk: stout, cylindrical, to 2 inches long and 1/3 inch through. Blade unrolls from 2 cone-like scrolls and looks tattered. Holdfast: slender, spreading.	Length: probably not over 150 feet despite published reports of larger size. A single large globular float is developed at the end of the long flexible stem and at the base of the relatively few but long flat leaf-blades. Stem shows outer layer of colored cells around a storage area that surrounds a central pith.	Length: reported to 1,500 feet making it probably the longest plant in the world. Blades: bearing thin, wrinkled olive leaflets with egg-sized bladders at point of attachment. Stem: rarely over ¼ inch in diameter. Leaves: 2 to 4 feet long and 3 to 4 inches wide. Holdfast: branched; about 1 bushel.
CLASSIFICATION AND RANGE	Green alga (Chlorophyceae). Order Ulvotrichales. Family Ulvaceae. Related <i>Monostroma</i> of single cell layer, with <i>Ulva</i> a double layer, and <i>Enteromorpha</i> with layers separated to make a hollow. <i>Ulva</i> on exposed rocks or wood from tropical Gulf of California to Alaska, and Gulf of Mexico to James Bay. Pacific Coast species, 13.	A brown alga (Phaeophyceae) Order Laminariales. Family Laminariaceae. Appears in closely related forms on Atlantic and Pacific Coasts. This species from Bering Sea to San Juan Island, Washington, with the related <i>A. fimbriatum</i> from Puget Sound to San Pedro. <i>A. cribrorum</i> from Massachusetts to Ellesmere Island.	Brown alga (Phaeophyceae). Order Laminariales. Family Laminariaceae. Found on our Pacific Coast and is definitely associated with rocky shoals and reefs, found in water from 10 to 100 feet deep but at its best where there are strong currents or heavy wave action. Found from Aleutians to California.	Brown alga (Phaeophyceae). Order Laminariales. Family Laminariaceae. Grows in water 20 to 70 feet deep, forming dense beds where conditions are right. Restricted to Pacific Coast from California to Alaska and on to Asia and Kamchatka. Bladder-supported leaves may float to surface.
REPRODUCTION	Some reproduction by fragmentation. Asexual reproduction through freeing 4 to 8 swimming spores from cell. Sexual reproduction by union of 2 similar swimming cells 8 of which come from a single cell. United cells germinate into irregularly thread-like plants that develop. Sporophyte stage differs from smaller-celled gametophyte stage.	Fruiting areas are irregular in shape and placement and appear darker and thicker than the regular vegetative tissues, usually more abundant near the midrib. Spore cases: in general elliptical in outline. Forms found growing in shallow water or tide pools are dwarfed in comparison with deep water plants.	Gamete-bearing cells are found in dense masses on certain parts of the plant. The freed gametes were formerly taken for zoospores or asexual spores but apparently they produce small plants that yield the regular sperms and eggs from which the huge plant develops after the egg is fertilized.	Named from the relatively large floats. Yields new plants in essentially the same manner as was described for <i>Laminaria</i> . Some areas may be well populated by fragmentation of the huge plants with the floats supporting the fragments where they may continue growth.
HABITAT	<i>Ulva</i> is chiefly marine but may occur in brackish water. Related <i>Enteromorpha</i> grows well on bottoms of river boats that alternate between fresh water and salt water. Some of the family grow in brine lakes where salinity is much higher than in the ocean. <i>Ulva</i> survives considerable temperature range.	The common name probably refers to the fact that the blade resembles the kitchen colander in its sieve-like appearance. Another common name, devil's apron, probably refers to the general apron-shape of the whole blade. The genus <i>Agarum</i> refers to the Malayan word agar-agar or "edible seaweed."	<i>Nereocystis</i> beds yield potash. Of the dry weight of the plant, about 25% is potassium chloride that at the outbreak of World War I was worth \$40 a ton, but which has since found greater values. The plants have some value as food for cattle as well as for raw fertilizers.	Yields the phycocolloid algin, alginic acid and sodium alginate, ammonium alginate, calcium alginate and chromium alginate, also much potash and iodine. Of the whole plant, some .28% is iodine. Algin was first separated in 1883, sodium carbonate being used to digest the plant material.
RELATION TO MAN	<i>Ulva</i> may foul shores causing bad odor after storm. May be boiled and seasoned and eaten as green laver or green slack although as food it is vastly inferior to other algae here discussed. Apparently the commercial possibilities of sea lettuces have not been studied exhaustively.	While the plant no doubt has many of the uses recognized for its close relatives, literature does not frequently list it as a commercially valuable plant. It should be assumed from its generic name that it is edible and that it may be important as a source of agar agar.	The common names include bladder kelp and the scientific name refers to Nereis, the daughter of the sea god, Neptune. So closely are the plants associated with rocky reefs that fishermen and sailors using shallow-draft boats recognize them as important navigation guides.	Is harvested commercially in California. In 1941, there were four United States concerns that produced \$1,500,000 worth of algin from <i>Macrocystis</i> and <i>Laminaria</i> , while a few years earlier none was produced on an extensive commercial basis.

HENWARE BADDERLOCKS <i>Alaria esculenta</i>	FAN KELP <i>Laminaria digitata</i>	ROCKWEED <i>Ascophyllum nodosum</i>	BLADDER WRACK ROCKWEED <i>Fucus vesiculosus</i>	GULFWEED <i>Sargassum filipendula</i>
Blade: broad, leathery, to 10 feet long and 10 inches wide, with small, lateral, wing-like leaflets below the broad, terminal blade, the leaflets being without midribs. Blade commonly with wavy margins torn and broken to the midrib. Stem: compressed, to 1 foot long and 1/2 inch wide. Holdfast: branched and rather elaborate.	Blade: of to 30 or more fingerlike segments each to 3 or 4 feet long or shorter and growing from a common point or expanded area at the end of a stout stalk that is to 5 feet long, flattened above and in section 5 feet long, flattened above and in section showing concentric growth rings but no mucilage ducts. Holdfast: fibrous.	Length: to nearly 10 feet but usually much smaller. Erect from a disc-shaped holdfast. Main stem and main branches: flattened, with egg-shaped air-filled bladders to over an inch long and 2/3 as wide, with usually but one to a branch. With flattened, club-shaped branches to an inch long, solitary or grouped.	Length of sprays: to 2 feet, with distinct midrib through all of the branches, rather regularly forked, flattened, olive green, with swollen bladderlike structures filled with gelatin. Fronds: tough, flexible, leathery. Holdfasts: branching, rootlike, leathery, with suckerlike ends.	Length: to nearly 1 yard. Erect, with main stems smooth, sparingly forked and bearing alternate, stalked leaves that are to 3 or 4 inches long and 1/3 inch wide, thin and sometimes forked but usually with saw-tooth edges. Stems also bear spurs that end in bladders that are to 1/5 inch in diameter. Holdfast: conical, spreading, lobed.
Brown alga (Phaeophyceae). Order Laminariales. Family Laminariaceae. Differs from <i>Laminaria</i> in possession of midrib in blade. Essentially northern. Commonest on exposed rocky coasts below tide levels. From Long Island north to Hudson Bay and Newfoundland. Nine Pacific Coast species from California to Alaska.	Brown alga (Phaeophyceae). Order Laminariales. Family Laminariaceae. At least 10 species on Pacific Coast of United States with <i>L. sinclairii</i> found from Vancouver Island to Obispo County, California. <i>L. digitata</i> ranges from Staten Island to Hudson Bay, Nova Scotia and New Brunswick, most commonly on exposed rocky bottom below low-tide levels.	Brown alga (Phaeophyceae). Order Fucales. Family Fucaceae. Commonly found growing with <i>Fucus</i> on rocky coasts or on rocks emerging from muddy bottoms below the tide levels. Ranges from New Jersey to Newfoundland and Baffin Island, Labrador and Cumberland Sound. Also in Bermuda.	Brown alga (Phaeophyceae). Order Fucales. Family Fucaceae. One of the world's most widely distributed plants, being found in the Arctic and temperate oceans of the world but this species not found much south of New York on our Atlantic Coast, although it appears from North Carolina to Newfoundland and Baffin Bay.	Brown alga (Phaeophyceae). Order Fucales. Family Fucaceae. This species grows attached to shells and stones in relatively quiet water from lowtide level to 100 feet deep. There are some 150 species of <i>Sargassum</i> in the world mostly about Australia and Japan and 17 on Pacific United States. This species, Florida to Nantucket.
Perennial, but each year blade is replaced by new growth. Ordinary plant seen is sporophyte or spore-producing, the sexual plants being microscopic and bearing either male or female sex organs with the female filaments being the simpler and usually bearing one terminal egg that on being fertilized develops into the sporophyte.	Perennial. The asexual zoospores and the sexual gametes are essentially alike. For some time it was not believed that sexual reproduction took place in <i>Laminaria</i> but this is now well established, the male and female sex cells being essentially alike.	In reproduction, the branchlets change into or are replaced by the sexual reproductive tissues that are either male or female, are yellowish, which drop from the main plant in spring following the winter's fruiting, and are replaced by new branchlets. The eggs and sperms are different in size and 4 eggs are in each egg sac.	Apparently there are no asexual spores produced. Sexual reproduction results from union of sperms and eggs produced on different plants from autumn to spring in the southern part of the range. Male receptacles are reddish when opened while the females are olive green but both are near branching tips.	Probably perennial, bearing fruit at maturity that arise from union of different sized sex cells with but one egg to an egg cell. Fruiting bodies are cylindrical and more or less forked. <i>S. fluitans</i> and <i>S. natans</i> of our Atlantic seas reproduce only by fragmentation, no fruiting bodies being known.
Named <i>Alaria</i> from the Latin "ala" meaning wing and referring to the wing-like leaflets below the blade. The sporophylls that bear the spores that take part in asexual reproduction are shed annually. Sporangia are borne on the margins of the sporophylls. The sexual plants do not resemble each other closely.	Named from Latin "lamina" meaning leaf or blade. Yields phycocolloid laminarin, a reserve carbohydrate, and fucoidin, a water soluble carbohydrate of no recognized commercial value. Rich in iodine, which constitutes .49% of whole plant; also considered high in certain vitamins and minerals.	In quiet water, these plants are more slender than in rough water. It occurs in salt marshes and in brackish water entangled with other plants or poorly attached to shells and other such objects. The plants appear as if made of cartilage. The broken or shed fruiting branches often are found in great numbers.	Yields the phycocolloid fucoidin, a polysaccharide first extracted by Kylin from <i>Fucus</i> and <i>Laminaria</i> in 1913. Like laminarin it as yet has no well established commercial value. It probably occurs in nature as a calcium salt and on hydrolysis it gives rise to fucose. Because of mucilage, plants do not dry quickly.	Name comes from the Spanish "sargazo" meaning floating seaweed. The traditional South Atlantic Sargasso Sea is not composed primarily of <i>Sargassum</i> . This sea, famous as dead spot in days of sailing, lies between lat. 25°-31° N. and long. 40°-70° W. Yields the phycocolloid algin, alginic acid and alginates of sodium ammonia, calcium and chromium.
Yields the food known as "kombu" from the northernmost Japanese Islands where it is used with meats and sauces or poured over rice or used as tea. Is eaten in Iceland and in Scotland and in Ireland and is known as henware, murlins, badderlocks and daberlocks in these areas.	In 1941, four United States concerns made \$1,500,000 worth of algin from <i>Laminaria</i> and <i>Macrocystis</i> . Japanese who eat it are free of goiter. Dried known as "kombu"; shredded and dyed green, as "ao"; crisped over fire, as "hoira kimbu," with sugar icing, as "kwashi." Tons harvested in Japan and Russia for fertilizer.	Of little or no economic importance so far as the literature is concerned, although it is possible that it has some value as fertilizer. The plant turns black on drying, has larger air chambers than <i>Fucus</i> and is in general tougher than <i>Fucus</i> , as might be indicated by its larger size.	Plants are collected by seashore farmers and spread on the ground for use as fertilizer. Has some value as a source of iodine and at one time was an important source of commercial potash. A medicine used in curing obesity has been taken from <i>Fucus</i> and it has been used to some extent in the making of cosmetics.	Japanese fishermen eat the tender tips of the floating plants of their region. Because of relatively small size of this species it is not likely to be of great commercial value compared with other algin producers such as <i>Laminaria</i> and <i>Macrocystis</i> and similar plants.

COMMON NAME SCIENTIFIC NAME	LAVER <i>Porphyra umbilicalis</i>	TENGUSA <i>Gelidium corneum</i>	CEYLON MOSS <i>Gracilaria confervoides</i>	PHYLLOPHORA <i>Phyllophora membranifolia</i>
DESCRIPTION	When young, narrow, but when mature like a broad, somewhat elastic membrane, fragile, often only one cell in thickness, purple to olive to brownish purple, but always with a smooth, satiny sheen. Attached by a small obscure holdfast at the center. Edges frilled or wavy in appearance. Whole plant appears slippery.	Frond: flat and horny, to 4 inches high, narrow, erect, branching in one plane being 2 to 3 times pinnate and with sections composed of somewhat compressed cylinders. Very variable in shape, size and color, being red to reddish brown, to purplish red and when exposed becomes a dirty white. Tip of the branchlets are club-shaped.	Frond: bushy, arising from a disc-like holdfast that frequently breaks, freeing the whole plant. Branches: to .1 inch in diameter dividing repeatedly and variously but not so conspicuously evenly as in some close relatives. Firm and fleshy and tapering to fine tips at the free ends. Dull purple red to purple, to green.	Fronds: to 20 inches long but usually shorter, with short stubby, wedge-shaped, forked or cleft branches each under an inch long. Several fronds arise from a single disc-shaped holdfast, sometimes as many as 20 arising from a single disc. Like a firm membrane that is dull purple or clear red but with some brighter areas.
CLASSIFICATION AND RANGE	Red alga (Rhodophyceae). Order Bangiales. Family Bangiaceae. On rocks or piling from the low-tide to mid-tide lines. This species from New Jersey to Hudson Bay and Newfoundland; closely related forms are in both hemispheres from Polar regions to Mediterranean, Australia, Tasmania, Cape Horn, and Cape of Good Hope.	Red alga (Rhodophyceae). Order Gelidiales. Family Gelidiaceae. The Atlantic Coast species is <i>G. crinale</i> , which reaches a height of 3 inches while the West Coast <i>G. corneum</i> is an inch higher. Grows in tufts on mud-covered rocks and on other algae. Most abundant on West Coast from California to Baja California, Mexico.	Red alga (Rhodophyceae). Order Gigartinales. Family Gracilariaceae. This species in shallow, warm, quiet bays attached or loose near bottom from the tropics and Florida to Prince Edward Island. <i>G. multipartita</i> or <i>G. foliifera</i> is much branched and found on both coasts. Other relatives in Africa, Australia, Britain.	Red alga (Rhodophyceae). Order Gigartinales. Family Phyllophoraceae. Found commonly growing on stones in shallow tidal pools or in water several feet deep, but mostly in warmer waters. This species ranges from New Jersey to New Brunswick, Prince Edward Island and Cumberland Sound.
REPRODUCTION	Asexual reproduction by means of spores freed to swim from rather large continuous areas of the blade. Sexual spores freed from plants that may be either male or female or both; in the latter case, the male and female portions being generally separated, with the males coming from a marginal band, and the females from over the surface.	Asexual spore cases are found in the surface of rather special areas or on special branches. Sexual plants are like those bearing asexual spores in general, with the male elements produced from the surface of considerable areas, and the female borne on inner tissues and spread through the general nutritive tissue.	Asexual spores borne in structures scattered over the branchlets, these structures being oval in shape and developed definitely from surface cells. Male element also produced from surface cells. Female element borne on structures on special branches but after fertilization these develop into conspicuous numerous hemispheres.	Asexual spores produced in rather large, slightly raised spots near the bases of the blades with surrounding cells obviously radiating. Male element produced on small, brightly colored blades and attached to the edges of these blades. Female element borne in stalked structures attached usually to stem.
HABITAT	An annual plant that may be found at almost any time of the year. The name is derived from a word meaning purple dye. The pressed plant does not adhere to paper when dry. Used in England as food as "laver"; in Ireland as "slack", in Hawaii as "limu," and in Japan as "amanori" or "amori." Boiled and eaten with lemon juice, spice or butter.	Yields agar (gelose), a phyccolloid, agarinic acid, and the salts sodium agarinate, potassium agarinate, calcium agarinate and magnesium agarinate. In Japan the species of most importance has been <i>G. amanorii</i> . Gelidium agar in 1% water solution sets at 35°-50° C. to form firm gel and melts at 80° to 100° C.	In the New England area, the plant is crisply bushy. Yields gracilaria agar, agarinic acid, and the salts sodium agarinate, potassium agarinate, calcium agarinate and magnesium agarinate. <i>Gracilaria</i> was the original source of commercial agar whose uses have been discussed elsewhere in this section.	A perennial plant. Found throughout the year but commonly fruiting in autumn and winter. Yields an agaroid that is possibly a kind of agar though it apparently has not been studied exhaustively or put into much commercial use in the United States. At least three species represented on our Atlantic Coast.
RELATION TO MAN	Chinese grocers in Hawaii have imported in a year 70,000 pounds of laver worth about \$12,000. Japanese cultivate nearly a thousand acres by thrusting in bamboo bundles on which algae grow to be harvested in 3 to 4 months. In 1901, such plantations yielded \$156 an acre, but now yield as much as \$300 an acre.	Probably the most important of all the agarophytes as source of agar necessary for bacteriological work, as medicine to relieve constipation, as food in form of jellies, soups, sauces and desserts. Gives rigidity to soft canned fish improving marketability after shipping. Known as "kauten" and "Oriental isin-glass."	<i>Gracilaria</i> is the chief commercial source of agar produced in the vicinity of Beaufort, North Carolina, and no doubt figures in commercial activities elsewhere. It is used in bacteriological work, in dental impressions, in health foods and in baking. In 1940, one U. S. agar factory produced 24,000 pounds; in 1945, 4 produced 200,000 pounds.	From Odessa and the Black Sea it is reported that a species close to ours yields a kind of agar, but as to any further commercial use we are not informed.

IRISH MOSS CARRAGEEN <i>Chondrus crispus</i>	BATTERS <i>Gigartina stellata</i>	DULSE <i>Rhodymenia palmata</i>	CHENILLE-WEED <i>Dasya pedicellata</i>	POLYSIPHONIA <i>Polysiphonia fibrillosa</i>
Fronds: to about 6 inches high, arising in clumps from a disc-like holdfast with flattened stems that divide and subdivide to form rather broad fans there being 5 or 6 subdivisions and the divisions taking place when the stems are about $\frac{1}{8}$ to $\frac{1}{2}$ inch wide. Stems: thick, tough, leathery, olive to dark purple to jet black.	Fronds: from 6 inches high to 2 inches broad, in thin, flat, gelatinous, leathery, wavy, wedge-shaped divisions that fork at the base only to subdivide again in the same plane at a high level. Unlike Irish moss has tufted protuberances on the concave side of the fronds. Dark purple to black and rigid when dried.	Frond: to nearly 2 feet long, with an inconspicuous stalk arising from a small disc-like holdfast and bearing blades that break into two or more divisions with the forks to 6 inches wide but usually narrower. Like leathery membranes that are purple or red in color. Frequently shows numerous smaller fronds near base.	Fronds: to 10 feet long, with the cylindrical stem covered with fine hairs that give the whole plant a velvety appearance. Stems: long and sinuous rather than bushy, with branches sparingly divided. Color: elegant "lake red" or pink, but when taken out of water appears like strings of purple jelly in masses.	Fronds: to 10 inches or slightly more long, appearing like pinkish or reddish, slippery "worms" hanging attached to exposed rocks at low tide or erect or weakly floating in shallow water. Profusely and irregularly branched, coarse at the base but fine at the tips. Light or dark brownish red to black.
Red alga (Rhodophyceae). Order Gigartinales. Family Gigartinaaceae. Most abundant on our Atlantic Coast from Maine to Carolina but also common on to Newfoundland growing throughout the year on wood, shells and rocks from mid-tide line to considerable depth. Does well in highly varied environments.	Red alga (Rhodophyceae). Order Gigartinales. Family Gigartinaaceae. Common in the tropics and from Massachusetts north to Nova Scotia and Newfoundland, growing with Spanish moss in shallow tide pools, on exposed rocky shores but always rather near low-water mark. Found at any time of the year.	Red alga (Rhodophyceae). Order Rhodymeniales. Family Rhodymeniaceae. Found from the mid-tide zone to deep water but in the southern part of the range restricted to the deeper water. This species ranges from New Jersey to Baffin Bay and Ellesmere Island and in Europe is found south to the Mediterranean.	Red alga (Rhodophyceae). Order Ceramiales. Family Dasyaceae. Found just below the low-tide mark usually in protected waters where the tide flows. This species ranges from Florida to Nantucket and extends on south into the tropics. It is rather abundant in the New York Bay area.	Red alga (Rhodophyceae). Order Ceramiales. Family Rhodomeliaceae. Over a hundred species found both on our Atlantic and our Pacific coasts, most commonly seen on stones and vegetation in shallow water but may be found in deep water as well. Not an abundant alga and in some New England areas is rare. New Jersey to New Brunswick.
Asexual spores produced in obvious cases formed below the surface of the tissue. Male elements borne in obvious cases on the surface of young branches with the female elements borne on other branches from the inner surface with the fruiting bodies to .1 inch across and swollen laterally.	A perennial. Asexual spores borne from immersed, irregular cases of the inner surface. Male elements appear from cases in terminal, closely branched stems and from surface cells. Female elements borne in special crowded clumps or branches and from areas under the surface and when fertilized develop into fleshy units.	Asexual spores are produced in scattered cases that appear as darker spots on the blade and are also indicated by a thickening of outer layer. These structures appear in winter season. In this species, no true sexual reproduction seems to have been discovered. Related species have a sexual reproduction that results in a swollen fruit with a loose case.	Fruits from midsummer to autumn. Individual plants produce either asexual spores or the male element or the female element. The asexual spores are borne in distinctive curved structures. The male cells are slender, pointed and usually filament tipped. The egg bearing units are usually stalked and .1 inch through.	Asexual reproduction through spores borne on somewhat spirally distorted branchlets. Male elements borne in spindle-shaped structures at the ends of the branchlets. Female elements borne in short-stalked, egg-shaped or spherical structures and forming a relatively large fruiting structure. Fruits in summer.
Fruiting occurs during the summer with the asexual activity more common in late autumn. Color varies from pale in shallow pools to purple in deep pools to iridescent in the sun. Named from Greek meaning cartilage. Extracted carrageen in 3% water solution gels at 27°-30° C.; and in 5% solution at 40°-41° C. Ash, 20%.	Fruiting takes place in winter. Dried plants do not adhere to mounting paper. Yields the phycolloid, carrageenin and carrageenic acid and the salts, potassium carrageenate and calcium carrageenate and with Irish moss is the principal source of these materials. Known as the polysaccharide carrageenic extract.	When dried this plant has a faint odor of violets. It is eaten in widely separated parts of the world. Icelanders dry it, make a flour of it, eat it raw or boil it in milk. Scots use it for chewing tobacco, as a relish, for medicine, or boiled in milk as food. Irish know it as "dillesk," boil it in milk, chew it and eat it with fish.	The plant sticks to paper well when mounted as an herbarium specimen but because of its delicate nature should be subject only to light pressure. It is considered a good late autumn alga and in the Woods Hole area is obvious as late as October. <i>Dasya</i> means hairy and the name is appropriate for this plant.	This is a summer annual that favors or rather does best in warm bays. The genus is represented by many species of which approximately a dozen are found along our Atlantic Coast and in which the differences are rather obvious and based on type of branching, stoutness and types of fruiting areas.
Of the water-free material, 65% is gelatin. Used in making gloss soaps, jellies, puddings, cosmetics, shaving soap, shoe polish, curing leather, sizing cloth and blanc mange pudding. Industry centers at Scituate, Massachusetts. Yields phycolloid, carrageenin. In 1944, industry in United States yielded about 500,000.	Carrageenin from <i>Gigartina</i> and <i>Chondrus</i> has a higher ash content (20%) than agar and requires 3% rather than 1% concentration in water to gel. It gels at a lower temperature than agar. In 1944, three United States firms produced \$500,000 worth of carrageenin in a standardized form.	In time of famine in Ireland, dulse and potatoes formed a diet that saved this important part of the world's population. In Norway, it is known as "sheep's-weed" because sheep are extremely fond of it, and seek it when it is exposed at low tide.	Apparently there is no obvious economic value to be attached to this plant unless one recognizes the beauty it certainly adds to what might otherwise be an uninteresting bit of environment. It is probably good for some marine animals and provides them with some shelter from their enemies.	Apparently there is little economic importance that can be attached to this rather beautiful red alga. It merely helps make a tidal area look as we think such a region should be. Mounted on paper a peculiar "mist" appears to surround the plant probably because of fine hair-like coverings not obvious otherwise.

(Continued from page 83) not have an appeal, so bakers and cooks use seaweed gelatins to put some "backbone" and some glossy appearance on certain foods they offer for sale. These materials may not improve the nutritive quality of what they sell, but they certainly improve their marketability. We cannot dismiss these substances with the idea that they have no food value, however, but we should not accept them as substitutes for certain essential foods. Let us look at a few of these.

Goiter is practically unknown to the Japanese, who use many seaweeds in their diets. This is explained by the fact that seaweeds are usually high in iodine content, and iodine helps prevent goiter. Apparently we can get our iodine through eggs or milk from poultry or cows that have been fed certain seaweeds. In this sense we can truthfully say that these plants may constitute a health food. There is no doubt that they are relatively high in such minerals as iron, calcium, sodium, phosphorus, potassium, manganese, aluminum, copper, zinc and chlorine, and some of these may be in a usable form. They also yield vitamins A, B, D, and E, often in attractive forms. Ordinarily, we do not expect these plants to yield energy-producing foods, but that need not disparage their value.

The biochemists have classified some of the substances they extract from seaweeds. Among the more important of these are the following: Agar is important largely for bacteriological work as a culture medium that has a low ash content, produces a firm gel in a 1 to 2 per cent aqueous solution, is soluble in hot water but not in cold, melts at convenient temperatures, and, as a gel, is practically transparent. It also finds a place in health foods and in baker's products.

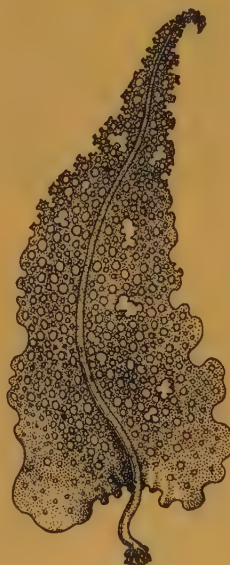
Carrageenin from Irish moss has a higher ash content than agar and a different melting point. It gels at a different point, but it is excellent in certain soups and jellies, and it is the substance that kept the chocolate in my malted milk in suspension. It finds a place in some kinds of soaps.

Algin was first extracted from seaweeds in 1883 by digesting the weed with sodium carbonate. In 1941, it was the basis of a half-million dollar United States industry, and it kept my neighbor's ice cream cone from drooling over him on a hot day, in all probability. Other substances would include funorin, from a Japanese seaweed that figures largely in the sizing they used for cheap textiles. It would include iridophycin from a California seaweed, laminarin from a weed off our Northwest coast, and a number of others, many of which are treated in greater detail in the tables accompanying this section. Not all of these are gel-formers, and most of them are not as yet completely understood. Few apparently are thoroughly appreciated.

And still we have said nothing of the material most botany texts give us on these plants. Since the texts say



SEA
LETTUCE



SEA
COLANDERS

much we will here say little, and try to keep that intelligible to the lay reader. Enough is given in the tables to show how highly varied the plants are in structure, appearance, growth habit and in reproduction, but it must be recognized that here we have only slightly scratched the surface. Possibly we can be criticized here for the meagre amount of orthodox morphology and phyllogeny we have given, but, if so, we can be equally critical of the small amount of material on the uses of these plants that appears in the texts. We are forced to neglect consideration of the emotional effect one gets when getting tangled in seaweed while swimming, or the fun of exploring weed beds with a glass-bottomed observation box. Some of these ideas will be considered later in this series.

Since we cannot do justice to this whole subject we can only hope that some readers will wish to explore seaweeds on their own. These kindred spirits will find a number of books and pamphlets that will be useful. Some are out of print and must be consulted in a library. Important among the books are the following:

Augusta Foote Arnold. *The Sea-beach at Ebb-tide*. The Century Company, New York. 1903.

John Merle Coulter, Charles Reid Barnes and Henry Chandler Cowles. *A Textbook of Botany*. The American Book Company, New York. 1910.

Nathaniel Lyon Gardner. *The Genus Fucus on the Pacific Coast of North America*. University of California Publication, Volume X. 1922-24.

A. B. Hervey. *Sea Mosses*. Estes and Lauriat, Boston. 1881.

Albert F. Hill. *Economic Botany*. McGraw-Hill Book Company, New York. 1937.

C. J. Hylander. *The World of Plant Life*. The Macmillan Company, New York. 1939.

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As We See It



Veterans as Gunners

WHILE the war was going on, game department officials and writers for hunting magazines generally predicted a tremendous increase in the number of gunners. These prognostications arose from surmise, from experience following World War I, and from wishful thinking—the more gunners, the more revenue from licenses; the more gunners, the more subscribers and advertising income for the hunting magazines. And anything to promote this idea is good business.

It remained, however, for Colonel George O. Van Orden, U.S.M.C., to come forward with some tangible evidence of the probable increase in hunting pressure. This proof undeniably pleases the predictors of more gunning, and must give pause to all interested in wildlife itself, and in perpetuation of proper numbers of game species as a part of our fauna.

Writing in *The American Rifleman*, official publication of The National Rifle Association of America, Colonel Van Orden presents the results of a sampling, or screening, of five thousand Marines returning from the Pacific theater of war. The Colonel appears to have made a quite objective study. He sought to find out how many of the veterans intend to hunt game with a rifle of some sort once they are back in civilian life; how many are not interested in any form of hunting; how well equipped the men are to handle sporting firearms.

Colonel Van Orden found that 65.6 percent of the Marines questioned intend to hunt animals known as game. Very few of these men hunted before the war, it was discovered. Many, we assume, were then too young. Of the remaining 34.4 percent, 18.6 percent thought they might hunt game with a rifle, and 15.8 said they definitely would not. Sixty percent asserted that they will hunt birds with shotguns, and lesser percentages were interested exclusively in trapshooting and skeet and other competitive shooting.

On the point of competence in handling sporting arms in the field, Colonel Van Orden found a generally somewhat disturbing situation. He discovered a preponderant tendency on the part of the men to rate themselves as better marksmen with military weapons than their service records showed. And he found them, by and large, woefully ignorant of sporting arms. This is not surprising in view of specialized

warfare of today. Relatively few concentrate on the rifle alone; more become specialists in machine guns and other more wholesale forms of destruction of the enemy. The Colonel was convinced that these men needed a period of education and re-training in the use of arms calculated to disturb the peace of birds and mammals, in contrast with weapons designed to disturb the Japanese. Colonel Van Orden says of the Marines he questioned that “while their military background prepares them to some extent for sport with firearms, their technical knowledge of weapons and their skill is *not* adequate for them safely to go shooting with target and/or sporting arms without further instruction.”

“In review,” the Colonel asserts, “from what we have determined through our tests of the returned veteran, there is little doubt that target and field sports stand on the threshold of a great expansion, a many-fold increase in the number of sportsmen on the ranges and in the fields.”

We have cited these facts, figures and conclusions because they also mean much to those of us whose major interest in wild birds and mammals is in them alive and not as targets. Even assuming a greater enthusiasm on the part of a Marine for firearms than may possibly exist among Army and Navy personnel, it would appear that our game animal life is in for a bad time. The ranks of licensed gunners may easily see a sudden increase of as much as fifty percent in numbers.

By and large our native game animals are not in a position to take such a heavy barrage. It can well be fatal to many species in many places, unless the authorities—state and federal—take these figures of Colonel Van Orden’s to heart and cut seasons and bag limits accordingly—and this year. Disaster can follow upon a policy of wait and see what happens. We did that with the ducks once and Nature saved the day before it was too late by providing better breeding conditions, with some aid from man through stiffer regulation and refuges. It can easily be too late unless wisdom, foresight and a good deal of courage are used to adjust permission to harvest the supply of wild game animals to the demand upon them—a demand that seems evident and inevitable and alarmingly large judging by these cited figures.



The hedgehog and fruit legend has it that the prickly little animal gathers fruit by rolling on the ground under fruit trees and gathering a supply on its spines, either for storage or for its young. This photograph purports to prove that this is fact and not fancy.

The Hedgehog and Its Lore

By FRANK W. LANE

THE viper glided across the path towards a patch of grass on the other side. Suddenly it halted at the sound of pattering feet. Then it rapidly coiled and thrust forward its head. Bearing down upon it, like a miniature tank covered with barbed-wire, was the snake's mortal enemy, a hedgehog. Against a hedgehog, a snake stands as much chance as a man with a bow and arrow against a Sherman tank.

The fight was soon over. With a quick lunge the hedgehog seized the reptile across the back, at the same time erecting its natural coat of mail, until even the tip of the animal's nose was protected. The snake made a clumsy jab with its fangs, but succeeded only in impaling its head upon the wickedly sharp spines.

Painfully the snake withdrew its head and struck again. But even as its fangs again met on the hedgehog's needle-like defenses the little beast's gimlet-like teeth grated on the reptile's backbone. The snake struck again and again in its frenzy. The

hedgehog's terrible spines were flaying its prey's head to ribbons. And then the hedgehog's teeth met. A convulsive shudder ran through the snake's body; its back severed, it grew limp. The hedgehog settled down to enjoy its meal.

Although welcoming such succulent additions to its diet as an occasional snake or two, the hedgehog by no means confines itself to reptilian fare. It makes use of a wide and varied menu. It has a particular fondness for insects and garden pests, and this trait alone endears it to the gardeners. Small mammals, birds, of all sorts, fruits and vegetables, all help to assuage the hunger of the "hedge-pig," as the prickly one has been appropriately called.

If a hedgehog is attacked it shows itself to be one of Nature's supreme examples of passive resistance. The shirt of prickly mail that constitutes the hedgehog's outer covering is admirably adapted for resisting the aggressor. The individual spines comprising this armor are hard without being brittle; elastic enough to withstand great violence. They cling, how-

A parent hedgehog and some of its spiny young. These animals are favored as food by the gypsies. The meat is said to taste like young chicken.

ever, with astonishing firmness to the hedgehog's tough, leathery skin. They form effective protection from blows or falls, and yet they can inflict painful wounds on any enemy coming into close contact with them.

Situated immediately under the hedgehog's skin is a powerful muscle, which, when contracted, at once turns the animal into a compact ball. The more it is irritated or alarmed, the more firmly the hedgehog contracts, and the more strongly and stiffly the spines face the enemy.

While a one-mile-an-hour shuffle is the ordinary gait of the hedgehog, it is capable of speed when the need arises. That fine writer on Scottish wildlife, H. Mortimer Batten, says he has seen a hedgehog run almost with the speed of a rabbit.

In addition to its sprinting powers, a hedgehog is a respectable climber, and is capable of swimming fair distances. Perhaps, like the quills of a porcupine, the spines of a hedgehog help to buoy it up in the water. One other gymnastic accomplishment of the hedgehog must be mentioned—despite its spines it can scratch its own back! I fear this operation must often be necessary, for hedgehogs almost invariably act as host to a battalion of fleas. Pick up a hedgehog and place it in a spotless white handkerchief, and when you later unwrap it you will find the surface covered with small black dots, every one of them alive and kicking!

Hedgehogs are good to eat, as the gypsies found out long ago. Their method of preparing this little animal for table is to cover its body with wet clay and place it on an open fire until it is roasted. When cooked in this way the spines come away with the hard clay covering and the flesh is ready to eat. The best "season" for hedgehogs, according to the gypsies, is Michaelmas, when the animals have been eating the crab apples that fall from the trees. The flesh is said to taste like tender young chicken.

Naturalists have spilt quite a drop of ink arguing about two alleged feeding habits of the hedgehog. One tale is that the animal drinks milk direct from the udders of cows and goats. The hedgehog cer-



tainly does not do this while the beasts are standing up, for the short stature of the hedgehog and the shape of its mouth are against such possibility. There is a fair amount of evidence to suggest that a hedgehog may imbibe milk from the beasts when they are lying down. The hedgehog's known fondness for milk (they sometimes knock over milk-bottles outside houses in endeavors to get at the milk) and the fact that milk often runs from the udders of milch animals are factors to remember in this connection.

The other alleged feeding habit of the hedgehog goes back to the days of Pliny, or farther. It is as interesting a bit of animal lore as is to be found in the whole realm of natural history. Writing in his "Natural History," published about 75 A. D., Pliny records the legend in these words: "Hedgehogs lay up food for the winter. Rolling themselves on apples as they lie on the ground, they pierce one with their quills and then take up another in the mouth, and so carry them into the hollows of trees."

From then until today the story has cropped up

from time to time. The hedgehog and fruit legend, as one may call it, was a favorite subject with the compilers of the bestiaries and other finely illuminated manuscripts of medieval times. The legend also figures in the armorial bearings of several English families. Moreover, in Lincolnshire there is (or was in the last century) a saying for a man with a ruffled temper: "He has gotten his back up, like a hedgehog going 'crabbing.'" And the famous English poet, John Clare, in his poem "The Hedgehog," written about a hundred years ago, says:

"The hedgehog hides beneath the rotten hedge
And makes a great round nest of grass and sedge,
Or in a bush or in a hollow tree:
And many often stoop and say they see
Him roll and fill his prickles full of crabs
And creep away. . . ."

Most modern British writers on the hedgehog discount the legend as a heritage from an uncritical age. But there was one writer, the late Miller Christy, who made an exhaustive study of the subject and arrived at the conclusion that the legend rested on observed facts, and deserved to be accepted as a most unusual and interesting but authentic piece of natural history lore. I, in common with all other later writers on the legend, am much indebted to the work of Christy.

The objection is made that if hedgehogs habitually collect apples and other fruit by rolling on them and collecting them on their spines, then many observers would by now have observed and recorded the fact. It must be pointed out that the hedgehog is largely a crepuscular and nocturnal animal. In the nature of the case, therefore, we can hardly expect such an unusual proceeding to be seen often.

Christy records several accounts from eye-witnesses, who claim actually to have seen hedgehogs collecting fruit in this way. It is of interest to note that most of these come from the Continent of Europe and not from Great Britain. The photograph reproduced with this article also comes from the Continent. But Christy was able to cite one observation from England, and that by a naturalist of some standing—Mr. W. H. Warner, a member of the Selborne Society and a reliable field observer. He wrote: "I well remember meeting with hedgehogs, in an Oxfordshire orchard, to the spines of which several apples were sticking. The apples had adhered to the spines, there was little doubt, when the creatures were rolling under the trees." Apparently Warner considered this no legend.

It is of interest to note that the name of the great Charles Darwin is associated with the positive side of this famous legend. He passed on to one of the natural history periodicals of his day an observation of a Mr. Gisbert, who was in the Spanish consular service. Gisbert said that, in Sierra Morena in Spain, he had often seen hedgehogs moving along with at least a dozen large strawberries sticking on their spines. In this part of Spain strawberries are abundant.

Various other accounts of the alleged habit could be given, but it may fairly be asked, assuming the truth of the story, why should a hedgehog go to the trouble of transporting food in the way described? Why does it not eat the fruit on the spot? There are two possible answers to this question. First, there is some evidence that hedgehogs store food before they hibernate. For example, "The King of the Norfolk Poachers," writing out of a wealth of experience of our animal life (but not of English spelling!), says in that enchanting book *I Walked by Night*: "If put to it he [the hedgehog] is a vegetarian as well, and will even eat crab apples, when he can find them. I have dug out half a peck of crabbs from rabbit burries and other holes where he have laid them up for the winter."

The second answer is that it is likely that the hedgehog transports the fruit to feed its young. It may be remembered that, unlike most British mammals, the hedgehog produces litters in the autumn, when, of course, apples are most abundant.

Such then, briefly, is the evidence for accepting the ancient hedgehog and fruit legend. If the photograph reproduced here is accepted as genuine, then I consider there is a strong case for accepting the legend as a very interesting piece of authentic natural history. In the words of Christy himself—words that have considerable significance: "Are we not apt, in these highly-scientific days, to become too contemptuously sceptical in regard to all ancient legends of the kind, and to forget that, however absurdly improbable they may appear at first sight, not a few of them have been shown to have some genuine basis in fact—often slight, but sufficient to substantiate and justify them. In all such cases, a cautious scepticism should be, of course, maintained up to a certain point; but I have never forgotten a dictum to which I remember hearing the late Prof. Huxley give utterance many years ago: 'I have always felt [he said] a horror of limiting the possibilities of things.'"

Boredom

By SUE WYATT-SEMPLE

Though he may be a *chiseler*
As someone has said,
I admire the woodpecker—
He uses his head!



Taming Wild Appetites

By ALICE SPENCER COOK

Ruth, a black bear born in the zoo, was strictly a vegetarian. Although she had ample opportunity to eat meat, she did not touch a bite of it until she was fifteen years old. She was a fine, healthy bear, giving birth to cubs every two years, and once to triplets. She turned out to be a highly proficient beggar, at which activity she is here shown.

THE MOON shone brightly on the tawny form of a mountain lion as he moved swiftly, a shifting shadow, along the rocky trail. He had traveled many miles, a score or more, with scarcely a moment's rest, and he was hungry. With each icy breath from down the canyon he got the scent of the deer he had killed the day before. After eating his fill he had covered the carcass with dry leaves and twigs. He could see the mound just ahead and he quickened his pace.

Something gleamed in his path. Click! A burning, stabbing pain zipped up his right leg as the jaws of a powerful trap closed with a snap. With a desperate snarl he pulled with all his might, but the cruel trap held fast.

Next day he looked at a strange and fearful world through bars in the Denver City Park Zoo. He cowered

in a corner, frightened and angry. Clyde Hill, the superintendent, came up to the cage and peered in. "Say, you're a beaut!" he said. "Two hundred pounds or I miss my guess."

He tossed in a huge hunk of beef. "There you are, fella," he said. "Guess you're good and hungry by now."

The lion crouched farther back in the corner and glared at him. When darkness fell he skulked about the cage. Then he stealthily crept toward the meat and sniffed. Beef! Bah! He lashed his tail in fury. Perhaps he remembered the deer buried under the leaves high in the mountains. Perhaps he thought of his mate, searching, searching. A wave of acute nostalgia swept over him, and he gave a high screeching cry. There was no answer. He sniffed at the meat again, and in desperation gulped down a mouthful



In the wild the groundhog feeds at any time the spirit moves, is by no means a dainty or finicky eater. In the zoo it develops a liking for regularity in eating, and insists on a clean plate for its favorite dish of corn, preferably on the cob.

rabbit, which was sniffed at and then ignored. Finally he provided a fat mallard duck. Surely they could not resist this dainty. One wolf, more curious than the others, picked it up and playfully tossed it about. The others joined in the frolic, but finally abandoned it without eating a mouthful. They had become definitely allergic to their former diet of wild game.

One day when the keeper threw meat in the pens for the coyotes, and a vegetable mixture for the bears, he noticed a strange thing. One of the coyotes, Lady Sly, turned up her saucy nose at the meat and made a hearty meal on the food meant for the bears.

and sulked back to the corner of his zoo apartment.

The lion's next meal was horse meat, which was worse than beef. Later on he had an occasional meal of liver or heart, which was worse still. Hill remembered the lion's distaste for these foods. Six months later, when a spotted fawn was accidentally killed, he said to himself, "Ha! Here's where the old boy gets a rare treat! Watch him go after this!"

But six months is a long time in the life of any wild animal, and, to Hill's utter amazement, the big cat had lost his taste for wild game and refused to touch it.

Just as the appetite of primitive man has been tamed, down through the ages, from raw meat to creamed dishes en casserole, predigested cereals and vitamins in capsule form, so, it seems, are the appetites of wild animals in captivity tamed from Nature's food to one more suited to a life of ease.

Hill had a similar experience with captive wolves. Their chief food in the wild is no longer the buffalo of bow and arrow days, but depends upon the region in which the wolf lives, as well as upon the season of the year. Small animals are gobbled up with one snap of powerful jaws; the larger ones are made helpless victims on which they may gorge enough to last a full week.

"Wild game is certainly a wolf's dish," the superintendent reasoned, so one day he tossed into the den a freshly killed pheasant and waited for the mad scramble over this tid-bit. All was serene. The wolves merely regarded it with grave suspicion and steered clear of it. A few days later, Hill offered the pack a

The keeper called the superintendent to see little Miss Sly. Hill saw that she was fat and sleek, and further observation confirmed his suspicion that she was strictly vegetarian. In the natural state a coyote is carnivorous, and only when desperately hungry will it eat juniper berries, prickly pears and other wild fruit. Fourteen thousand coyote stomachs analyzed by the Denver office of the Fish and Wildlife Service revealed not more than one percent vegetable matter.

Lizards and snakes, including rattlesnakes, occurred in three percent of the stomachs examined in the fall, but only one percent of those examined in the winter. Nine centipedes were found in a Texas coyote stomach. Two coyotes from California, another from Washington, and a fourth from Arizona had eaten fish. Birds were not uncommon, some stomachs disclosing the presence of three different kinds. But one stomach out of every three contained rabbit, either Jack rabbit, snowshoe, or cottontail, and one out of every three contained carrion.

In the case of little Miss Sly, Hill recalled that as a whelp she was smaller and weaker than the rest of the litter. She was often pushed aside at mealtime and was forced to be content with what vegetable mixture she could filch from the bears. Gradually she had learned to like it to the extent that she ate it in preference to meat. "This," he says, "is an extreme example of how a change of rations tames the appetite of all wild animals."

Another vegetarian was Ruth, a black bear, born in the zoo. She was fifteen years old before she would

Buffalo in the zoological park acquire a taste for alfalfa, and soon seem to prefer it to their natural diet of buffalo grass.

eat meat, although she had ample opportunity to do so. "And she was as fine a specimen as I ever saw," Hill declares. She gave birth to cubs every two years. Triplets were born to her on one occasion.

The wild bear, as everyone knows, is omnivorous. He is not a bit finicky about his food. Almost any kind will do if there is enough of it. He turns over a rotten log and licks up some fat grubs, or finds some wild berries or plums. Then, if it is his lucky day, he comes across a swarm of bees in the hollow of a tree. In spite of myriad stings on his tender black nose, he helps himself to their store of wild honey and licks his chops in huge enjoyment of such a hard-won delicacy.

"Such a bear," says Hill, "was presented to the zoo. Obviously we could not feed him grubs and insects, and buds and shoots of young trees. But we were ready for him nevertheless. We had made experiments on the ideal food for bears, and from the original complicated mixture of meat, vegetables and sweets we evolved a simple concoction of cornmeal and bran. His admiring public furnished an overabundance of sweets.

"He became so accustomed to our balanced diet that last fall when we turned him loose in the nearby Rockies he haunted mountain cabins, overturned garbage pails and otherwise made a pest of himself. Evidently he found it poor picking to go back to grubs under a log, wild berries and the roots of trees."

The skunk, although a friendly little fellow, is one of the lesser known of the common animals. Belonging to the weasel family, he is a meat eater, but, unlike the weasel, he is a poor hunter. More often than not the skunk must content himself with sluggish beetles, sleepy grasshoppers, meadow mice and small snakes. In the late spring he fares better, for he finds many a bird's nest or family of young rabbits hidden away in the dense undergrowth.

For his size, the weasel is one of the most efficient hunters in the entire animal kingdom. His slim brown body moves with such rapidity that his intended victim has no chance. Sometimes he may kill just for the joy of killing. The meat he eats must be fresh, still warm in fact, and he seldom will touch any animal he has not killed himself.

"But the wild appetite of even a weasel can be tamed," the zoo superintendent contends. "When penned up for a while he discovers that a slab of cold storage meat isn't half bad, that liver or heart from an animal killed last week is very good indeed, and the meat of yesterday's chicken is delicious!"



The largest and without doubt the most handsome of the North American rodents is the thick-furred beaver. The staff of life for him is the bark of trees. For variety he likes lily bulbs, green twigs, leaves and grass. The first food offered a captive beaver was alfalfa, which he rejected as so much spinach. Coarse corn meal and bran met the same fate. Vegetables, such as beets and carrots, and fruits, consisting mostly of apples, he simply pushed out of his way. But hunger at last drove the zoo beaver to take a nibble, and then a bite. Now he gets up on his hind legs and begs the keeper for a second helping.

Another rodent, the prickly porcupine, reacted almost identically as the beaver. Every quill expressed his deep displeasure but, finally won over, he became an enthusiastic convert to his "tame" diet.

If there is one thing a groundhog enjoys more than sleeping it is eating. His fat, roly-poly body is ample proof of this. Little pig that he is, his one waking thought is food, and he cherishes no vain ambition for a stream-lined figure. Any kind of vegetation will do, from a cabbage leaf to a bean stalk. In the late winter, when he awakens, ravenous from his long nap, food is scarce. So he will gnaw at the bark of a tree, knowing that better days are coming, when he will sample everything green in sight, leaving a trail of uneaten debris in his wake and then return to his untidy burrow for another nap. His main characteristics are his habit of eating at all hours and his slovenly ways. Hill maintains, however, that the groundhog soon adapts himself to zoo meals served at regular hours, and demands a clean platter, if you please, for his corn, which he likes best on the cob.

The deer and the elk love to browse. Many varieties of leaves and twigs are eaten with great gusto. The tender shoots of young trees in the spring, and wild fruit in the fall, round out their diet and they are completely satisfied.

It is not feasible to allot enough space to provide



Deer were fed a specially prepared oil cake—a mixture of ground hay, vegetable oil and molasses—when browse was scarce in winter. They learned to like this change of diet so much that they often seemed to prefer to remain on relief instead of in the hills.

growing food for captive deer or elk, so hay is substituted. This is supplemented with root vegetables, such as beets and carrots, and cracked grain. As in the case of the other animals, the taste of these ruminants undergoes a complete change, and they would find it a severe hardship were they turned loose to forage for themselves.

One winter, 15,000 deer and elk in the Colorado mountain parks were fed oil cake—a mixture of ground hay, vegetable oil and molasses—to tide them over until the deep snow melted and new vegetation appeared. "Unfortunately," says R. G. Parvin, Game and Fish Commissioner, "they learned to like this artificial food so well that, to my dismay, the relief problem remains acute in spite of ample browsing and grazing facilities in their native haunts in the hills."

A wild antelope grazes contentedly all day on the wild, wind-swept prairies. As to food he is not capricious, just so it is grass; any old grass. But in captivity an antelope became hypercritical about his food, and found no appetite appeal in the provender of his ancestors, after his taste had been educated to cracked corn as an entree, with a side dish of carrots, a green salad of grass clippings and an after-dinner cigar in the form of a long brown leaf of raw tobacco. This last is given as a medicine, and he soon acquired a voracious appetite for it, becoming a confirmed addict to the weed.

On the range the buffalo was perfectly satisfied with buffalo grass. He never counted calories, and if any vitamins were lacking he did not show it. But in captivity he soon acquired a taste for alfalfa, corn and the inevitable carrots. He now prefers them to the buffalo grass of his wild days.

"The appetite of wild birds can be tamed as well as that of mammals," the Superintendent of the Park

states. "Take, for instance, the vulture. He lives on carrion, but, to be fair, what else can he do? His heavy, unwieldy body is not built for swift flight, nor his talons for grasping and killing his prey. He is doomed to wait until some animal dies before he can eat. I recall vividly one vulture which, when cornered, disgorged an evil-smelling mass, repellant alike to man and beast. This was his defense. We captured him and fed him on fresh meat instead of carrion, and now he shows a marked preference for it."

The pheasant, in his ceaseless search for insects and larvae, will often turn up a kernel of wheat or corn. In his constant quest for food he gradually cultivates a taste for grain, and sometimes becomes a perfect pest to farmers who have other plans for their crops.

Wing-clipped mallards skim over the surface of a park lake, ever on the lookout for water bugs or small fish. Their broad beaks are often busy with tender green vegetation along the water's edge. But, as any child visitor to the zoo will testify, one rattle of a paper bag and the birds desert their hunting in a mad scramble for a feast of dried bread or stale cake.

All authorities agree that proper food in the right proportions is important to the physical well-being of wild animals. When wild appetites are tamed, new problems arise. Hill relates that on one occasion he noticed that the fur of one of the bears was mangy, and she was thin to emaciation. "Her case puzzled me," he says, "and worried me, too, for naturally we are proud of the fine health of our animals. Her condition grew steadily worse and she began to have fits. In desperation I checked up on her food and there I found the trouble. An inexperienced keeper had fed her nothing but stale bread donated by a bakery that often had a surplus. When I took the bread out of her diet, and fed her (Continued on page 106)

A Modern Infamy

By LUCY FURMAN

THE craze for furs in the past thirty years has set many of us wondering where the immense supply comes from. Knowing that, for centuries, furs were the luxury of kings, nobles and the very rich, we are amazed to see how widely they are worn today. How can this be?

The facts are these. Up to this century, only a few of the finer furs, such as ermine, sable, marten, sea-otter, Alaskan seal, mink, were thought fit for use, and the prices were very high. When these finer furs became rarer, the fur trade experimented. To its joy it found that commoner, coarser furs, hitherto scorned, could be either plucked, clipped and dyed to ape their betters, or made attractive as they were. Thus the cheap fur fashion was launched.

Able now to have the appearance of luxury without its cost, women went wild. The demand, fanned into flame by the spectacle of Hollywood stars swathed in beautiful furs, multiplied a hundred, a thousand fold. There was no need, now, to send trappers to remote wilds—in every wood, field, farm and stream of the continent men and boys were trapping every wild mammal, from mole to mountain lion. Muskrat, rabbit, foxes of all kinds, raccoon, opossum, skunk, squirrel, beaver, badger, bear, weasel, mink, coyote, wildcat, wolf, lynx were demanded by the fur trade. During the 1920s, a hundred million pelts were sold annually on the North American market, and the manufacture of fur garments became a billion dollar industry. After that, the supply dwindled.

How were these vast numbers of animals taken? Not humanely, as our Indians took them, by shooting or deadfall, but by the device commercially known as the steel trap. The first of these of which we have knowledge was a huge implement used in the reign of Queen Elizabeth to take, not animals, but poachers, and was a worthy contemporary of the rack, thumb-screw and iron-maiden. Later, hand-made modifications of it, in smaller sizes, were brought to America for use in trapping furbearers. Indian tribes refused at first to use these, saying they would never subject the "little people of the woods" to their long torture. White men had no such scruples, however, and when ways were found to make traps by machinery, the



A fisher caught in a trap that has sprung up and will hold the suffering animal until the trapper comes along to dispatch it, or until it has gnawed its foot off and escaped.

use of them soon spread around the world.

How does the steel-trap act? It does not kill, but, hidden in the ground in a runway of the animal, seizes a foot or leg in powerful jaws, sometimes toothed, which crush the flesh and often break the bone. Then the jaws hold the torn limb for hours, days, sometimes a week, in a pressure so frightful, so unendurable, that numbers of the victims gnaw off their own legs to escape it. This is called "wringing off", and makes the trapper very angry. To prevent it, he fastens the trap to a bent sapling, which, springing up, holds the animal suspended by its crushed paw until he comes, at his sweet will, to knock it in the head. Like the women who buy the furs, the trapper gives no thought to the animal. The price its pelt will bring is his only concern. Beginning, usually, as a small boy, who may think it manly to laugh at the struggles of his catch, he becomes more callous with every winter's trapping. If the trapper does think at all, he excuses himself with the hoary lie that the first blow of the trap's jaws so numbs the foot or leg that thereafter there is no feeling.

Women buyers have some excuse for their indiffer-

ence. The method of taking furs has been carefully and purposely hidden from them. A bulletin sent out within the fur trade in the early days of the cheap fashion reads, "The public mind must be so saturated with a desire for furs as to brush aside any emotional condition." The latter two words meant the horror and revulsion women of conscience must feel if they knew how the furbearers were taken. Therefore they must not know. A conspiracy of silence was created. It extended everywhere. No magazine, dependent on its advertising, dared print the facts; few newspapers had the courage. On the contrary, many misleading articles were published, representing fur-trapping as a romantic and hazardous sport, instead of the greedy and fiendish business it is.

Let three ex-trappers tell what they know at first-hand. The first letter is from a man in northern New York State:

"I have trapped animals since I was twelve years of age, have seen much suffering on the trap-line, and have dreamed of a trap to take animals without the terrible pain of broken bones, lacerated limbs, gangrene, fly-blows, and everything associated with the old steel-trap. . . . I once saw a large beaver caught by the front leg. The flesh was entirely gone to the bare white bone, and in its struggles to escape upon my approach the bone snapped with a sickening sound. The beaver immediately fainted, and, before it recovered, was dispatched. . . . With the strides of the scientific world, why should animals



A fox caught in a pole trap that holds the animal suspended and in agony, often for days.

be subjected to the same tortures they were years ago?"

The second letter is from a Tennessee man:

"The pain suffered by an animal in the ordinary steel trap must be terrible. Think how your hand or leg would feel with a wire tied around it until the blood was cut off, and the bones crushed and broken. The pain is so great that the animal seizes the trap or the imprisoned foot or leg in its teeth. It rolls and tumbles in an effort to regain its freedom and relief from the intolerable pain. It cannot free itself, and finally lies in the cold and snow or rain, often for many days, suffering the agony of a thousand deaths. I have known trappers to fail to visit their traps until the hair was slipping from the animal."

The third quotation is from the book *Pilgrims of the Wild*, by Grey Owl, the famous Scottish-Iroquois

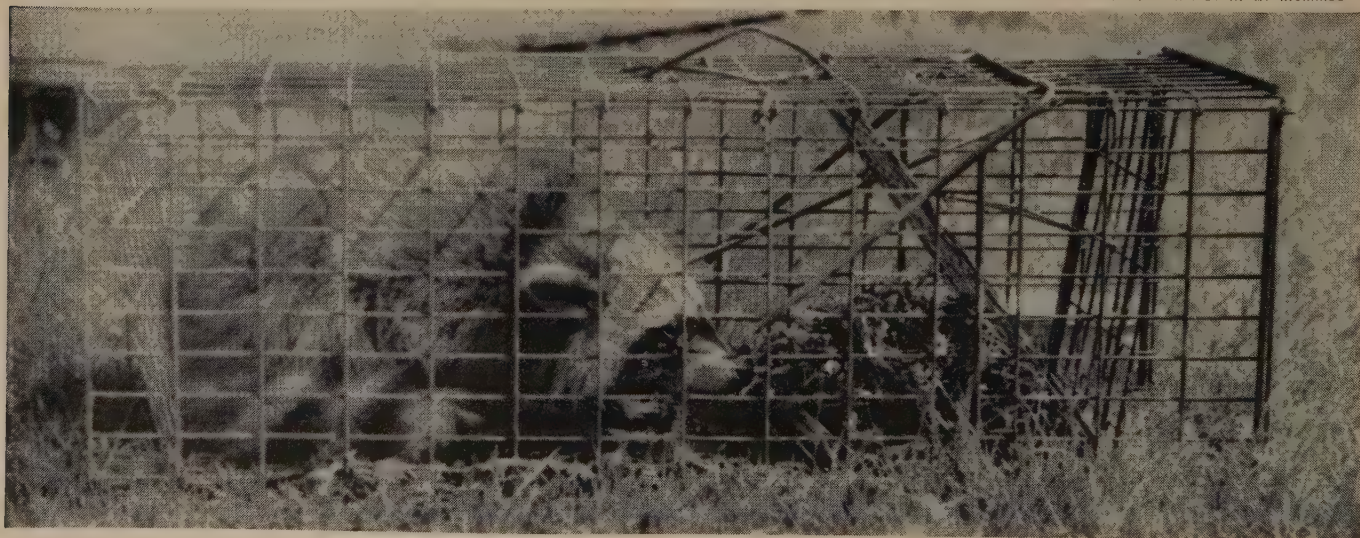
half-breed of Canada:

"The sight of frozen, twisted forms, contorted in shapes of agony, and the spectacle of submissive, despairful beasts being knocked senseless with an ax handle, and then hung up in a noose to choke out any remaining spark of life while the set was being made ready for a fresh victim, moved Anahareo [his wife] to deep compassion. I remember particularly a lynx that after the strike screamed out like a woman, and, not yet dead, tried to crawl to her in the anguish of its last extremity."

In another place Grey Owl writes: "I remember once . . . hearing a sound like the moaning of a child.

There are humane traps that catch the animals alive, as in the case of the raccoon here. These are used by state and federal agencies but are more expensive and bulky than the mass-produced steel traps, and thus are little used by the trappers. A humane trap on a new principle awaits material for production.

PHOTOGRAPH BY A. M. RICHARDS



Even the fur of the coyote holds favor with the fur trade, and this wily animal is widely trapped for its often exaggerated attacks on domestic livestock.

... I found a beaver suspended in this manner [spring pole trap], a female, heavy with young ... and in a dying condition. My attempts at resuscitation were without avail, and shortly after three lives passed into the discard."

Here is a quotation from the leading trappers' magazine, *Fur, Fish and Game*:

"The long-line man puts out three lines, that each take two days to get over, so that he gets over his lines once a week. ... Some of the animals will be in the traps a week, but in cool weather most of them will live through it, and there will be little loss from spoiled skins."

There you have it—by men who know.

Imagine your hand crushed in a carpenter's vise and held there for hours, days, a week. Add to this the fact that wild animals have far keener senses than yours, and suffer more, not less. Then multiply this agony by thirty million, and you get some idea of the enormous cruelty that is going on each winter throughout this continent, and at the very hour you read this. The State of Louisiana alone boasts of an annual "crop" of six million muskrats from its wide marshes, all trapped cruelly, and not with the "drowning-sets" used by trappers along small streams, which mitigate and shorten the suffering. Additional, are the many thousands of other furbearers trapped in Louisiana.

Of all the furbearers, the red fox—with its variations, the black, the silver, the cross—is said to be most sensitive, as it is the most intelligent. It often dies in the trap of burst ventricles of the heart—as Christ died on the cross.

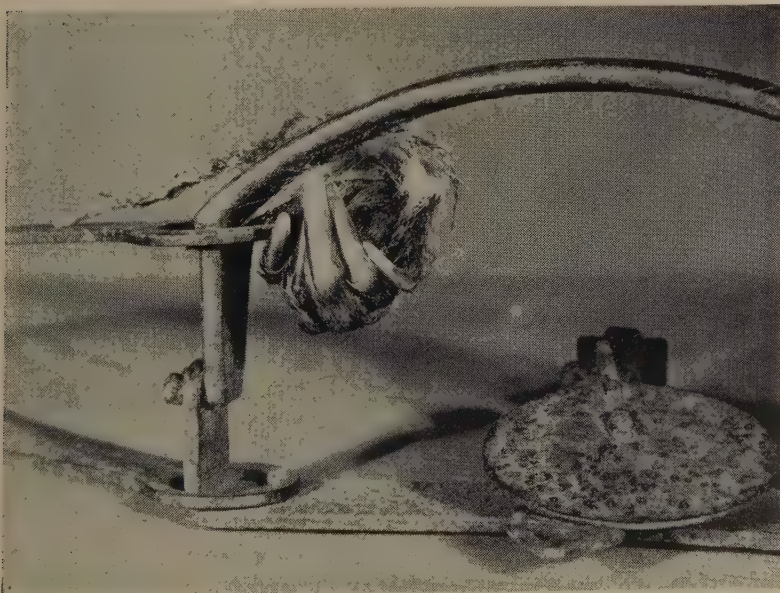


PHOTOGRAPH BY LEO D. HARRIS

Although, at any time, the rich trap manufacturers, by putting their mechanical engineers to work upon the problem, could have produced non-injuring traps, no effort seems to have been made, so long as the cruelty could be hidden. The first voice raised against the atrocity was that of a retired naval officer of distinguished bravery in two wars—Lt. Commander Edward Breck, who, seeing about his camp in the North Woods dreadful instances, in 1925 founded the Anti-Steel-Trap League. He began offering money rewards for the invention of humane traps, and informing the women of the nation, particularly the thinking club women, how their furs were taken. He asked them to work for state laws against the steel-trap.

The General Federation of Women's Clubs was the first important body to approve and take up the work, at its 1927 Convention. Modified laws were passed in South Carolina in 1928, in Georgia in 1929, and in Massachusetts in 1930, and a more complete law in Kentucky in 1938. The death of Commander Breck in 1930 was a severe blow to the cause, although the League was carried on by his widow until broken health compelled her to discontinue it in 1943. Daughter Associations for the Protection of Furbearing Animals have been formed in Canada and the United States to continue the work of the League. Men and women of courage and faith are needed in every state to form state branches, and I urge all who are willing to work in any way, by speaking, writing, or giving money, to communicate with me, at Frankfort, Ky., or with Miss Olive Latimer, Honorary Secretary (Continued on page 108)

PHOTOGRAPH BY W. J. SCHOONMAKER



This torn paw, left by a beaver, is mute evidence of suffering in the jaws of the steel trap.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south. Time given is Standard Time.

Mapping the Moon

By ISABEL M. LEWIS

THE latest, and by far the largest, map of the moon has been recently completed by H. Percy Wilkins, a British selenographer who is a well-known observer of surface features of the moon. The new map is 25 feet in diameter, and is contained in 107 sheets, each 22 inches by 30 inches. It is bound in three volumes, and has been deposited in the Library of the British Astronomical Association in London. Mr. Wilkins has been mapping lunar markings for many years. His observations are made with a twelve and one-half inch reflector of his own making, and, with powers greater than 300, he has detected many delicate features hitherto unrecorded. His findings and drawings have been published over a period of many years in *The Journal of the British Astronomical Association*. In 1924 he published a map of the moon in 25 sections. This was on a scale of 60 inches to the moon's diameter. In 1932 another

200-inch map of the moon was published, and work was then started on the map recently completed. This latest map shows great care and attention to detail. About 60,000 craters or ring-like formations of all sizes are depicted. These range from tiny craterlets, two or three miles or less in diameter, to the typical lunar craters, ten to sixty or more miles in diameter, and the great walled-plains, one hundred miles or more in extent.

The first maps of the moon were made soon after the discovery of the telescope. The earliest were not much more than rude sketches made by Galileo and other astronomers of that day, and the systems of rays connected with some of the prominent craters, such as Copernicus and Tycho, were greatly exaggerated. The map by G. Montanari of Modena, in 1662, was of interest because he was the inventor of a primitive type of micrometer for accurate measure-

ment. It consisted simply of a lattice-work of fine silver wires in the focal plane of the telescope, and he used it in the mapping of the lunar surface. In 1645 Langrenus, a Belgian, produced a map on which he gave names to lunar objects. The names were those of ruling French, Spanish and Austrian personages. Hevelius, in 1647, used the names of terrestrial features. Riccioli's map of 1655 was the foundation of those of today. It was made up of sketches of prominent markings put together, and, for the names given to lunar features by Langrenus and others, he substituted the names of great philosophers, astronomers and mathematicians. These are the names still used to identify lunar craters and other conspicuous features. They read like the list of Who's Who among the great men of all ages.

Some years ago the International Astronomical Union decided to draw up a list of accepted names for lunar formations, and this was published in 1935. About 30 additional names were added to the list later. How unfortunate for the great men of the present century that all the choice lunar features have already been named! In some lunar regions, where there are overlapping mountains, or where craters crowd upon craters in greatest confusion, it was difficult to decide to which objects individual names were to be given. Outstanding names among the selenographers who have so painstakingly measured and mapped and studied the pock-marked face of our satellite, in addition to those we have already mentioned, are Mayer (1775), Schröter, at the beginning of the 19th century, followed by Madler, Beer, Neison, Schmidt, and later Elger. At the beginning of the present century William H. Pickering, noted also for his studies of the planet Mars, compiled a photographic atlas of the moon, and studied and sketched many features in craters and elsewhere.

Many remarkable photographs of the moon have been made in the present century, and have been published by the Paris, Lick, Harvard, Yerkes, Mt. Wilson and other observatories. It is a well-known fact, however, that no photograph taken, even with the most powerful telescopes, will show as much detail in lunar markings as can be glimpsed with the same telescope visually during moments of exceptional seeing. The best photographs of the moon

show an abundance of intricate detail, and are taken with telescopes of long focus. On September 15, 1919, a remarkable photograph of the moon was taken by F. G. Pease at the Mt. Wilson Observatory as a test of the new 100-inch telescope, using an equivalent focal length of 134 inches, which corresponds to a diameter of 15 inches for the lunar image. Although the seeing on that night was only fair, 3 on a scale of 10, the enlarged photograph, which was on a scale of 75 miles to the inch, showed the exquisite struc-

ture of a pattern of intricate detail. One of the most interesting features, visible to a less degree with smaller telescopes, was the enormous number of minute holes, or crater pits, as small as half a mile, or less, in diameter. These remind one of the holes in pumice or lava. They were seen in greatest number on the outer slopes of certain craters, and on the high level plains and plateaus of the southwest portion of the lunar surface. They appeared in the greatest profusion on the outer slopes of the rampart surrounding

the crater Copernicus, which is nearly 60 miles in diameter. This crater is supposed to be the finest, by far, of all the lunar craters, although Tycho, near the south limb of the moon, has a long meridian-like system of rays, extending for hundreds of miles in all directions, and seems at times quite comparable to Copernicus in splendor. The two craters are nearly equal in size.

Copernicus is in an isolated position on a vast plain, and this adds to its impressive appearance. It is also the center of an intricate system of rays, feathery and light-colored in appearance, which extends to a great distance from the crater. Its huge, encircling ramparts are broad and terraced within, like so many of the walls of craters, and its outer slopes are long and rugged and crossed by deep gullies. Many mountainous peaks surmount the encircling ramparts, one of which towers to a height of 11,000 feet above the floor of the crater. Five bright little mountains rise from the floor of the crater. It is on the outer slopes, and on the surrounding regions, that the countless little crater pits appear. These are in conspicuous detail in the Mt. Wilson photographs, and others taken with large telescopes.

Next to the lunar craters in interest—indeed, some think of equal interest—are (Continued on page 108)

Child Watching the Stars Appear

By ROSE MYRA PHILLIPS

His button-nose seems buttoned to the pane
As eagerly he scans the firmament.
It's time that stars were out. . . . There one swings high
Over the steeple of a pine! A tent
Of clouds unfolds and two bright stars are seen.
Above the road that climbs a nearby hill,
A starry cluster makes a shining path. . . .
Soon starlight silvers boy and window sill.

Though he grow tall and travel far, and though
He view the seven wonders of the world,
Still when he lifts his vision to the skies
Where starred celestial glories are unfurled,
Into his heart will pour familiar light
Bringing such rapture as is his tonight.

The School Page

Edited by E. LAURENCE PALMER

Professor of Rural Education, Cornell University,
and Director of Nature Education, The American
Nature Association

SEEING SEAWEEDS IN SCHOOL

WHILE most schools are far from a seashore and a great majority of children are not likely to have the opportunity of exploring the weed-drift that harbors crabs, shrimps, worms and molluscs, nevertheless there is hardly a school that does not have available for study some of the products of seaweeds. The insert in this issue of *Nature Magazine* is designed to help the average layman recognize some of the uses of marine alga products, particularly from viewpoints that are usually emphasized for other things in general science. But the average general science text fails to do justice to these plants, and, therefore, this insert may fill an important gap.

But what can a school do to study seaweeds and seaweed products if it happens to be located so far from the edge of the continent that the children do not know what salt air smells like? The teacher can easily get from the dye store, the drug store and from other sources a variety of interesting materials with which to work. Probably most universal among these would be some agar, such as is used in bacteriology, or, more intimately, in correcting constipation. With a small sauce-pan, some water, an electric hot plate or stove we are ready to investigate. Here are a few things to investigate.

Will the agar dissolve in water that is lukewarm? Put a small quantity in the sauce pan with some water and raise the temperature of the water. At what point does the agar dissolve? Will it melt if water is not present? Weigh out a small amount and to this add water weighing fifty times as much. Mix the two. What percent solution would you have by weight? Is the agar lighter or heavier than water? Let the water in which you have dissolved the agar cool. At what temperature does the liquid begin to turn into a jelly-like substance? Is this jelly a liquid, a solid, a gas or none of these?

Fill a small bottle half full of firmly-packed agar that has been powdered. Measure out another half bottle of hot water. Pour the hot water into the bottle of powdered agar. Does the bottle hold the half bottle of water and the half bottle of agar; does the mixture fail to fill the bottle, or more than fill it? When the agar and water in the bottle cool and form a gel, do they overflow the top of the bottle, or do they retract and only partly fill it?

Pour some hot agar solution out on a piece of glass and let it cool. Record at what temperatures different changes take place. For example, when is a gel formed? When the agar has been well cooled, dry it thoroughly. Does it stick to the glass? Does it quickly become brittle, as would ice, or is it elastic? When it is thoroughly dried, is it still elastic? In what condition would your agar solution be if it were at the same temperature as your body?

If possible make some really pure ice cream. Mix some agar or gelatin with a spoonful. If this produces no change, put some dissolved gelatin in the cream before you freeze it. Put a spoonful of the pure ice cream on a dish beside a spoonful

of the ice cream and gelatin. Which of the two melts the more quickly? These are only a few of the many ideas that should come to an alert teacher trying to study states of matter with the help of agar, a seaweed product.

It may not be as easy to identify commercial products that may come from a seaweed source as it is to investigate the properties of something *known* to have been extracted from seaweeds. However, this is not too important for our purposes here. Suffice it to say that an interesting experiment may be carried on by asking the children to bring to school a variety of things that seem to have been made of "plastics." Combs, toothbrush handles, knife handles, buttons are among a few of the things that suggest themselves. Do not experiment with things that you cannot afford to lose, of course, but when a collection of broken things, such as suggested, is gathered try these experiments. Immerse them in boiling water. Touch them to a hot flat-iron. Touch a small fragment of some piece with a lighted match. Do they all respond equally to these conditions? Some of the materials may be made of rubber, some of celluloid, some of seaweed gelatin and some of commercial plastics of a great variety of forms. Certainly you know the characteristic odor of burning rubber, and the characteristic flash of burning celluloid. What do you think boiling water would be likely to do to celluloid and to rubber? If you do

not know, see if you cannot find the answer by your own investigations. What we might tell you should not be so convincing as what you can learn by yourself, and learning by yourself should be basic to developing the scientific attitude.

If it is possible to procure any of the other commercial substances suggested in the chart section as coming from seaweeds, get some and learn how these differ from the agar with which you have experimented. Do such simple things as mixing powdered cocoa with cold water, with milk and with powdered gelatin, or with malted milk, to see if the cocoa settles to

the bottom of the glass with equal rapidity in each case. From what you see, you can get some idea of the nature of things called colloids. If you do not know anything about them, consult your dictionary, or any good, simple, science text. Unfortunately, most general science texts apparently do not recognize their existence, but that cannot keep them out of our everyday experience. In fact, any living tissue is necessarily of a colloidal nature. Possibly these suggested studies may give some idea of why so many bottles of medicine have the direction on them "shake well before using." Colloidal substances do not have to be mixed and shaken so frequently to keep the ingredients evenly distributed as do those that are not colloidal.

If your group is botanically inclined, seaweeds will be well worth studying. Very probably the laboratory will have some bladder wrack or kelp in jars. If you wish, any of the major biological supply houses will be able to supply fresh material in which may be seen the interesting reproductive story of the plant. But do not let the morphologist and the taxonomist in you overlook the other aspects of seaweeds. They are beautiful. They have specific and important uses. They are woven into the lives of other organisms. They help mold the topography of the area where they grow. They are associated with health problems. Many of them are economic. So, do not spend all of your time and energy prying into the private sexual or asexual lives of these interesting living things.

If your school is located near enough to a seashore so that you can actually make collections of seaweeds, or if some member of the school has the opportunity to visit such a place, it is entirely worth while to encourage the making of herbarium

Best Seller

By PAUL CHURCHER

So much must be forgotten! So much goes
Upon the crowded book shelves of the heart;
The fragile orchid and the storied rose
Are priceless volumes. Still I keep, apart,
One small, shy flower, as common as your name,
Gay as your smile, with all the wonder in it—
Read and reread since the morning Jane
Once picked a violet in a casual minute.

specimens. While most land plants must be glued or otherwise fastened to the mounting paper, many of the marine algae are themselves well supplied with a covering of mucilage. This serves to hold the plants to the paper if proper pressure is applied. Usually, under these circumstances, it is best to spread the specimen on the paper as it is to be finally. Then a sheet of waxed paper may be laid over it and a blotter under the mounting paper. When pressure is applied, the water passes through the mounting paper to the blotter, and the alga sticks to the paper where it cannot stick to the wax. The more delicate algae may be floated into position by first sinking the mounting paper in a large pan of water, then arranging the alga as is desired, then drawing off the water by siphoning it, or even raising the mounting paper slowly to the surface. A most satisfactory and interesting collection may be made by using cards no larger than an ordinary book page. No one can expect to mount the whole of a plant that may be a quarter of a mile long. But if you do make small mounts, try to include samples of the important parts that are different. Get a piece of the holdfast if there is any. Include special branches or parts that bear one or another of the reproductive structures suggested in the tables, and, of course, you will want representative pieces of the blade and stem. If there are special floats, these may be sectioned, as may coarse stems. The sections may be mounted with the other parts.

But we must not forget what is probably the most interesting of all studies of seaweeds. When you and your pupils have learned to recognize the more conspicuous of the seaweeds, set out to record your notes on the kinds of animals that favor them for food or for shelter. Are particular fish, mammals, birds or molluscs found most frequently in the vicinity of any particular seaweed, and, if so, why? Interview fishermen, boatmen and others to see if they recognize any seaweeds as being reasonable indicators of the presence of desired catches, or of shallows, reefs or tide rips. Learn if there are any examples of local people who have been drowned because they became entangled in seaweed while swimming and became frightened and exhausted by the experience. In short, make as wide a study as possible of the role seaweeds play in your everyday experience whether you live where you can hear the surf roar, can breathe the salt air, or whether you have to get your marine experiences vicariously, or through industrial products that spring from marine algae. For the fun of it, try to find some one person who has never had, at some time, some important service in which a seaweed product has not played a part.

HOW GREEN WILL YOUR GARDEN BE?

(Continued from page 80)

mind and heart of a child, although that is a good way to start. However, schools or youth organizations are not devoting as much attention to this phase of youth training as they should. It affords a wide-open opportunity for service.

Gardening for wounded veterans and the blinded has proved to be one of the greatest of rehabilitation aids. There is something about sun and soil that heals broken bodies and jangled nerves. There is need for skilled civilians to help over-worked staffs in service and veterans' hospitals. Not everyone is fitted for this specialized work. Temperament as well as training are important, and women seem to be better than men. But it is the noblest kind of service for those who are qualified to do it.

The opportunities for enjoyment, for service and for better living are unlimited in the field of gardening. It is one of the few constructive things that the war has given us. In the 20,000,000 Victory Gardens that were planted during the war, the food produced was of inestimable value. But perhaps even greater was the love for the soil and growing plants that many families acquired for the first time. A nation that was headed towards a completely mechanized civilization, faced about and again put its feet and fingers into the soil. It is such elemental things that have made America great. We should not forget them.

DEBUNKING OCEAN LORE

"Hyalis . . . choosing a deep, twisted shell . . . pressed it against his ear and for hours at a time . . . listened to the roar of the eternal ocean in the heart of the magic conch."

This fancy, embodied in numberless works of prose and poetry, is entirely unfounded. There is no mechanism in a shell by which a sound could be preserved or reproduced. The murmuring heard is that produced in the auditor's inner ear, mainly by circulation of the blood. To be convinced, just try an ordinary tumbler, a prosaic tin can, or more conveniently, cup the hand over the ear. You will hear the low roar as well as from a shell and if your ears are as different as is often the case, a distinct "ocean" will sound in each.

"And smell the good salt air."

To be literal, it must be said that salt has no smell. Try it dry, or in solution, even snuff it in your nose; there will be no response. What is smelled on approach to a beach-bordered coast is seaweed, with some seasoning of dead fish, crabs, and other drift, decomposing somewhat slowly because of the presence of a small proportion of salt, but decaying, nevertheless, and hardly a subject for romantic interpretation. W. L. M.

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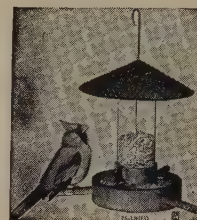


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NATURE AND UNITED NATIONS' EMBLEMS

(Continued from page 68)

phant with golden tusks, a tower and driver. The elephant signifies cleverness, courage and chastity. This order, founded by Christian I in 1426, was recently conferred on Field Marshal Sir Bernard M. Montgomery, who is the only living person, outside of Denmark's royal family, with the right to use it today.

Two crossed swords, surmounted by the date palm, constitute the royal seal of the Kingdom of Saudi Arabia. The crossed swords signify courage, while the palm denotes life, peace and the sustaining security of the mother country. The seal is printed in green, the holy color of Islam, denoting the unity of the State and the religion. This country consists chiefly of sandy wastes, with here and there oases where wandering tribes of Bedouins stop for rest and refreshment.

THE DESERT AT NIGHT

(Continued from page 75)

dash to death under the wheels of the slowly-moving car.

The smaller species of these furry-tailed, daintily-built rodents can be caught by hand, or under a hat or butterfly net. They seldom try to bite, even though they struggle madly and their panicked hearts beat violently. These little animals furnish the *piece de resistance* for owls, coyotes, foxes, badgers and many kinds of snakes. They are among the lowliest in the succession of eat and be eaten.

Toward midnight, temperatures of air and soil drop to the point where most animals retreat to cover. They disappear under rocks, down burrows, into all the cracks and crevices in the bare, unlittered desert surface. Then it is time for the weary reptile hunter to lift his eyes from the ribbon of road and find his own retreat.

We drove toward the mountains, headed for a pass leading upward to the far reaches of the lonely Mojave desert. There we planned to camp. As we climbed, the air grew cooler; then a cold wind blew downward from the snowy peaks of San Gorgonio Mountain.

Camp was located in a cove of junipers, and there, weary from the long drive and the strain of searching for signs of life on the flowing stream of highway, we spread our sleeping bags.

Except in summertime, there is scarcely a night when the words of the lover, swearing fidelity and eternal love "till the sands of the desert grow cold," do not come to mind. Fidelity sworn on warmth of desert sand might last from sunset to midnight, but assuredly not much longer. Winter, too, often finds snow piled deep over the creosote

bushes, bowing them humbly to the ground. The uplifted, spiked tufts of the macabre Joshuas are laden, until each arm bears a gigantic snowball. Then almost all desert life shrinks into its shelter, and the camper huddles close to the skimpy fire of the desert dweller.

Dawn always comes too early to the snake hunter, who has seldom turned in before midnight. Day arrives with a glow of such unbelievable color that only the most callous can stay asleep. Only the most weary will forego the few hours of early morning collecting. Only the most hardy can endure the rapid rise in temperature that follows the rising sun.

While the sun's rays are still not too hot, and the ground is still cold from the low temperatures of night, day-loving reptiles crawl sluggishly from their burrows and spread every available inch of body surface to the grateful warmth of the sun. Some lie flat on the ground; others mount the nearest clod of earth or pinnacle of rock. The more arboreal lizards find a sunny spot on the trunk of a mesquite, or on a twig of the many bushes that dot the desert. Each species follows the ancient pattern of its ancestors. Knowing this, the experienced collector is able to collect the largest number of his specialty, or the largest number of species.

Sand-dwelling reptiles are most readily caught by tracking, a difficult although not impossible art that grows in fascination as perfection comes with experience. These reptiles, gorgeous, smooth-skinned, fringe-footed lizards, use the snowshoe principle in working through loose sand. The little, dust-colored horned rattlesnakes or side-winders, and tiny gem-like orange, yellow and black spadep-nosed snakes, are also specialists in sand locomotion. They must be tracked in the early hours of the day, as soon after sunrise as possible, so that the oblique rays of light throw even the faintest tracks into relief. One must work fast. The ladder-like track of the sidewinder, discontinuous slanting bars of shadow in the early morning light, may be followed for as much as a quarter of a mile—a night's run. And one of the fascinations in tracking lies in reading the story of a night's adventures.

Here and there are the criss-crossing pad marks of gamboling kangaroo mice, telling by their arrangement that they have been busily engaged in kicking showers of sand at the little snake, their insidious attacker from ambush and consumer of their young. That they should dare to use combative tactics against this speedy reptile is testimony either to family devotion, or a sporting nature never suspected in a rodent, although we accept the same spirit in the hawk-harrying birds.

Sometimes a sidewinder track will show that a captious female has rejected one suitor after another (four in one

case) only to accept another. For some unaccountable, possibly feminine, reason, this may be a spindly little runt about half her size.

The most unexpected activity one might expect in a rattler, or any snake for that matter, is the desire to dance, yet now and then one encounters signs in the dust indicating rhythmic movements that can only be called a "snake dance." To date, no one knows whether members of the opposite sex participate, or whether the dance is a "phony war" between rival males. Whatever the final explanation may be, even rattlesnakes, the sprightly little sidewinder and the dour and ponderous desert diamond-backs, have their moments of romance. Ophidian love, while not romantic to the human way of thinking, is as expressive of enthusiasm as that of any other animals, and results as satisfactorily. In view of their antiquity and present abundance it could scarcely be otherwise.

As the sun rises higher and hotter, the desert reptiles, species by species, retreat to their own particular types of shelter, and thereafter venture out for food in short sallies. For those that must wait for sight of their prey in the open, where shade is difficult to find, other tactics for temperature control must be practiced. These species orient their bodies until they present to the sun only its smallest possible section. However, even these must retreat to shade, and on very hot days even the hardest reptiles go underground where coolness and grateful darkness give them comfort.

Snakes frequently employ a most admirable thermostatic behavior. They lie at the mouth of their dens exposing to the sun only sufficient body area to achieve the desired temperature, increasing or decreasing their loops to maintain almost perfect temperature control.

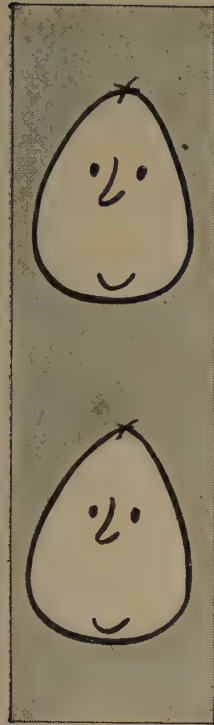
From these and other slowly accumulating bits of information, knowledge is being gained concerning possible climatic conditions of the past as well as the effects of climate in the present. The statistician-engineer and executive of industry, the high school and college boy and girl are contributing, little by little, to the store of knowledge of living things, from mouse to man and reptile to bird. The sum of this knowledge, like all knowledge, may strike a spark that will illuminate new aspects of a way of life, and each is learning self-discipline in work and thought.

ANSWERS TO THE "AN" IN "ANIMAL"

1. (i) 2. (k) 3. (n) 4. (g) 5. (y)
6. (q) 7. (c) 8. (p) 9. (t) 10. (x) 11. (h)
12. (s) 13. (u) 14. (a) 15. (m)
16. (f) 17. (o) 18. (j) 19. (w) 20. (z)
21. (b) 22. (v) 23. (r) 24. (d) 25. (l)
26. (e)

1946

1956



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in the next few years

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Science in the Indies

Science and Scientists in the Netherlands Indies. Edited by Pieter Honig and Frans Verdoorn. New York, 1945. The Board for the Netherlands Indies, Surinam and Curacao. 491 pages. Illustrated. \$4.00.

In editing this volume Drs. Honig and Verdoorn have sought to present a picture of the development and status of a number of the branches of the natural sciences in the Netherlands Indies. The interruption of the war years complicated their task. Contributions were made to the present volume, however, by about seventy authors. The book includes original articles specially prepared for it; reprints of articles, some available for the first time in English; a number of travel accounts of distinguished visitors; shorter notes, biographical sketches, reviews and the like; a list of the scientific institutions, societies and workers in the natural science fields in the Netherlands Indies at the time of the Japanese occupation. The result is a reference book of scientific and historical significance, with much that is of popular interest to anyone with a concern for the Malaysian islands.

"At the present time," the editors say in a foreword, "when the right of peoples to self-government is being so much discussed, we may be permitted to ask whether scientific studies should be pursued in the same way as in the past—in a part of the world where nature and custom do not inevitably impel the rational recognition and application of facts established by the pure and applied sciences. To the implied question—namely, whether or not the occidental has the right and duty to continue his works as in the past—this book may offer a partial reply.

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Holland Needs Books

American literature, old and new, is greatly desired in the Netherlands, which has been deprived of our books for five years. While those in the field of popular science would be especially welcome, any spare books may be forwarded to Dr. W. D. Van Wijngaarden, Director, Rijksmuseum, Leiden, Holland. Books not suitable for the museum will be properly placed.

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TAMING WILD APPETITES

(Continued from page 96)

exclusively on a corn chop and bran mixture, she quickly snapped out of it."

In Yellowstone Park, signs of "Do not feed the bears" are very much in evidence. "The impression given is that it is dangerous to the public," Mr. Parvin says, "but the practice is equally dangerous to the bears. Park officials try to counteract this injudicious feeding in every way possible, short of administering bicarbonate of soda. These bears are wild. They live a natural life and are not pampered in any way except for the scraps and sweets fed them by tourists, and their ready access to garbage pails. But when they go into hibernation they have not built up the necessary supply of fat and energy. The cubs, because of this deficiency, often are not strong enough to survive. The polar bear, except in rare cases, will not even breed in captivity. The grizzly, however, retains his wild appetite, and, as a result, continues sturdy, as evidenced by the huge hump on his neck."

The consensus of opinion is that taming the appetite tames the nature of the wild animal, as well. Once tamed, he finds it difficult to go back to the food of the wild. When the necessity of hunting no longer exists he soon loses a great deal of his ferocity.

Forest Research Guide

Publication of Forest Products Research Guide, a catalog of organizations having information on various phases of wood research, is announced by the Research and Product Development Committee of the American Forest Products Industries, 1319 18th Street, N.W., Washington 6, D. C. It lists 860 sources of data. A limited edition has been printed, and copies are available at the above address at two dollars each as long as the supply lasts.

Microfilms Listed

For years the Library of Congress has had important collections of photographs in its custody, and steps are now being taken to make them better known and more easily and widely available. This is reflected in the preparation of "Index of Microfilms, Series A, Lots 1-1737" covering photographs from many parts of the country and picturing the land, natural resources, the towns and cities, the people in them, their homes, their work, their misery and joys, amusements and recreation. The purpose of this microfilm is to enable persons at a distance to become familiar with the content of the collection, and to order publication prints

by their negative numbers. Copies of this index are available on request from the Information and Publications Office, The Library of Congress, Washington 25, D. C.

WORK OF A WASP

By ELLA WOODWARD

As I sat sunning myself on the steps, a soft thud called my attention to the concrete landing below me. A long, thin, red- and black-bodied burrowing wasp had flopped on the platform. Underneath her thin body she carried a huge green worm. Her burden was too heavy to permit her to fly, but she was walking in a frenzy of haste. By the time I got to the wasp she was crawling over the curb to the ground, and to the foot of a cedar tree a few feet away.

For a moment the wasp darted this way and that, then seemed to get her bearings and moved about a foot. Then she dropped her worm, and, with her two forefeet, began removing cedar needles and small pebbles from a spot that looked to me like every other inch of ground under the tree. After moving several tiny stones, she lifted away a larger one, revealing the door to her abode. This was about a half-inch in diameter.

Still working in frenzy, the wasp lifted the worm to the edge of the burrow opening, laid it down, then crawled into the burrow herself. Turning around, she reached up and pulled the worm in after her. In a few seconds she emerged, quickly replaced the large pebble in the opening, chinked up the cracks with fine bits of gravel and dirt, which she tamped down with a tiny stone. She made a loud buzzing with each tamp. After carefully raking more dirt and bits of leaf over the spot, she flew away.

I had stood directly above the wasp during the whole episode. She ignored me, and I was absolutely still, so entranced with what was going on and with her uncannily human methods. Indeed, I felt a little guilty at spying on what was supposed to be her secret.

Protecting an Investment

About 20 years ago a Georgia town faced a business problem familiar to many towns and cities. It needed to spend about \$75,000 for a water storage and treatment plant. A dam would create a reservoir for run-off from a watershed of nearly 900 acres. This watershed was land that had already lost more than half its topsoil by erosion. This fact suggested that soil would continue to wash down to fill the reservoir. There was danger that so little storage space would be left in 40 to 60 years that the town would lose most of its original investment.

Neighboring towns had had just that experience.

With this problem before it, Newnan, Ga., decided to protect its \$75,000 by investing enough more to buy the eroding land and reforest it. Newnan has increased the investment by \$32,500—less than 50 per cent. Results indicate that the reservoir will last many years longer than it would have otherwise. The town now owns all but 90 acres of the watershed. A planted forest is growing. While the forest was starting—from 1925 to 1937—the reservoir lost storage capacity at an average rate of 648,000 gallons a year. Since 1937, with the forest well started, this loss has dropped to an average of 179,000 gallons a year, a decrease of 62 percent in the rate of filling. With less sediment, there is less expense for treatment of the water to make it clear and clean.

This true story is from a report by Carl B. Brown of the Soil Conservation Service on conditions in reservoirs in the Southeast where erosion has proved a serious menace to investments in reservoirs. A survey by that agency shows that half the existing reservoirs are losing more than 1 percent of capacity annually. A third of them will be filled to the point where they will be useless in less than 50 years from date of construction, and 56 percent will not last 75 years.

Brown points out that ownership of watersheds allows adoption of the best methods of erosion control. An alternative is active cooperation with the Soil Conservation District in the watershed. Cities and towns, he emphasizes, cannot afford to let reservoirs fill. They can well afford to supply inducements to farmers to conserve the soil, to keep it on the farms and out of the reservoirs.

Erosion from cuts along highways and in roadside ditches is a common source of the soil that fills reservoirs and reduces storage capacity. Towns and cities can gain by helping to pay for control of this damaging washing.

Indiana Birds

Common Birds of Indiana. By Earl Brooks. Noblesville, Indiana. 1945. The Blatchley Nature Study Club. 96 pages. Illustrated. \$1.25.

Hamilton County is centrally located in Indiana, and of the 358 species of birds listed for the Hoosier State, 222 have been recorded from that county. This book covers this number, plus thirty additional species regarded as relatively common for Indiana. These are discussed in an appendix by Sidney R. Esten. Dr. Brooks is the librarian of the Blatchley Nature Study Club, and all of the profits from the sale of this little book will go into the treasury of the club for its building fund. The treatment of the subject matter is entirely popular and 140 illustrations of variable quality are provided.

More Johnsonia

Johnsonia, the mollusk publication of the Department of Mollusks of the Museum of Comparative Zoology, Harvard University, rounds out its first volume with the presentation of a 58-page discussion of "The Genus *Murex* in the Western Atlantic" by W. J. Clench and I. Pérez Farfante. Started in 1941 and named for the late Charles Willison Johnson, the component parts of the first volume have appeared from time to time. It has been welcomed by both amateur and professional students of shells. *Johnsonia* is edited by William J. Clench, Curator of Mollusks at the Museum, and he has supplied his share of the material contained in the first volume. Much remains to be published—and learned—on the mollusks of the Western Atlantic, and *Johnsonia* will continue to help fill gaps as it starts on its second volume.

Foresters to Japan

At the request of the War Department, three United States foresters have gone to Japan to participate in a six-month survey of the forests and forest industries of Japan and Korea. Comparatively little is known of the extent of the forests of the two countries, or the impact of war upon them. However, before the war, Japan was second only to the United States in the use of wood and was practicing forestry to build up her resources in this field. However, she was a large importer of timber. The foresters are Dr. M. A. Huberman of Washington, D. C., William S. Swingler of Philadelphia and Robert J. Seidl of the Forest Products Laboratory at Madison, Wisconsin.

Boy Scout Week

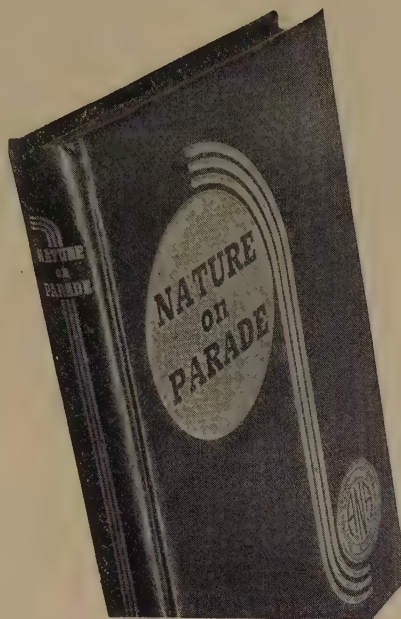
With the slogan "Scouts of the World—Building Together," Boy Scout Week will be observed from February 8 to 14, and mark the thirty-sixth anniversary of the founding of the movement in America. Emphasis this year is being placed on the "good turn," more outdoor activities, better records for advancement, additional opportunities for community service, and bringing more boys and men under the influence of the Scout Oath and Law. Since 1910 more than 12,500,000 boys and men have been registered in Boy Scouting.

Foresters Elect

Shirley W. Allen, professor of forestry at the University of Michigan, Ann Arbor, has been elected president of the Society of American Foresters for the two-year term of 1946 and 1947. Clyde S. Martin, chief forester of the Weyerhaeuser Timber Company, Tacoma, Washington, was chosen as vice-president. Ten Senior Members of the Society were elected to the grade of Fellow.

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A MODERN INFAMY

(Continued from page 99)

of the Canadian APFA, at 163 Delaware Ave., Toronto, Canada.

A person to head the work in the United States is specially needed. We have thought that a young veteran, possibly an officer, so badly crippled or maimed in the war that he will understand the suffering of the furbearers, and be able to tell of it eloquently in public, may be the one needed. He must be well educated, and a good speaker. If you know such a man, write me of him. Although the officers of our state branches work without pay, using membership fees only for printing and mailing literature, our national head must, of course, have a salary and traveling expenses.

Scores of good humane traps have been invented—wire-cage, wire-net in purse shape, instant-killers, chain-loop legholds, rubber-jaw legholds, some of them being in continual use by state conservation departments. As most, however, cost more than the old trap made by the millions, and some are more difficult to set, the trapper will usually have none of them, and the laws passed are never well enforced.

It is only a few years since the invention of a trap, looking at first glance like the old steel trap, but making use of an entirely new principle. In this the animal is taken and held without any pain until it begins to pull and struggle. When the full force of the spring is released, there is suffering as long as there is struggle. In consequence, the animal soon lies quietly in the trap, and there are no wringing-offs, or torn limbs, and when the trapper comes and shoots the animal in the forehead, the capture and death are entirely humane. Not only that, trapping with this device may be selective. Unwanted or too young furbearers may be released to grow up, and dogs, of which thousands are now ruined and tortured in steel traps every year, can be liberated unhurt. This trap would have been on the market before now, but the rubber and labor for its making could not be obtained. It will be made as soon as possible. Although its price will be probably five or ten cents more than that of the old trap, this will be no obstacle, trappers who have seen it say, as so much fur is saved. Many of them—all the younger ones, and farm boys—are really glad to be able to trap decently.

Federated Club officers should revive the work for laws in their states, and also inform their members as to the right and wrong furs to purchase. There are many beautiful furs that are never trapped and are all right to buy—those of all the hoofed animals, sheep, lamb, goat, kid, cattle, pony, deer and camel families, such as Persian lamb, astrakhan, krimmer, vicuna, moufflon, caracul, alpaca, llama, moose, caribou, elk, reindeer, the

Alaskan seal (no other), and those furs certified in writing to have been bred on fur farms.

I feel sure no thinking woman will ever desire a fur coat which, if mink, has cost the multiplied agony of eighty creatures; if Hudson seal mink-dyed, natural muskrat, kolinsky, nutria, or many others, has cost that of at least fifty; if squirrel, that of 200; if raccoon, that of eighteen to twenty; if ermine, which is winter weasel, that of 260; if a skunk jacket, that of twenty; if a fox scarf, that of two to seven. In four-fifths of our United States, fur is never needed; it is only a needless fashion. It serves only to pile up fortunes for the fur trade, and feed the vanity of woman.

Help us, men and women of America—help with voice or pen or money, to remove this largest organized cruelty of history from our midst. Norway, Sweden, Finland and even Germany have outlawed the steel-trap. Why should not America?

MAPPING THE MOON

(Continued from page 101)

the lunar clefts and rills. Elger has referred to them as features of whose origin we are "supremely ignorant." In length, they vary anywhere from ten to three hundred miles. In width, they may be anywhere from two to less than one-half a mile. Their depth can only be guessed at, but is believed to be only a few hundred feet. They show a gradation from coarse grooves, which can be seen even in small telescopes, to thin, hair-line markings that can be detected only with the largest telescopes and under the best conditions. Wilkins, using his 12½-inch reflector and powers exceeding 300, has detected many of these delicate clefts. This suggests that the possession of sufficient optical means, a very clear atmosphere, and high altitude are needed for the detection of such minute lunar details. He considers them the most interesting of all lunar features. They may be found on any part of the lunar surface, although not as frequently on the surface of the Maria as elsewhere. They may extend for many miles in straight lines, and often traverse, without interruption, ridges, craters and other obstacles. At the ends they usually thin out, and often end at a mound or crater. One selenographer has compared the lunar rills to inverted river beds because, as often as not, they become broader as they traverse the higher elevations on the surface. No satisfactory explanation of these numerous lunar markings has so far been advanced. Selenographers continue to add more and more of these peculiar hair-like lines to their maps of the moon, but we still remain in ignorance of their origin.

Among the planets in February, Mercury and Venus will be too close to the sun to be seen. Venus will be in superior conjunction with the sun on February 1, when it has the same phase as the full moon. It then passes to the evening sky. It may appear low in the west by the end of the month. Mars will be in Gemini throughout the month and is easily recognized by its ruddy color. As it was in opposition to the sun in January, it is now in fine position for observation. Saturn is also in Gemini this month only a few degrees southeast of Mars. The two planets are an interesting contrast in color and brightness. Saturn is a pale yellow; Mars red. As the distance of Mars from the earth is now increasing, its brightness is slowly decreasing. At the beginning of the month it is noticeably brighter than Saturn, but at the end of the month they are almost equal in brightness. Jupiter is now in the constellation Virgo a few degrees east of Spica and rises shortly before midnight. It is much brighter than Mars and Saturn.

Herbal of Rufinus

The Herbal of Rufinus. Edited from the Unique Manuscript by Lynn Thorndike, assisted by Francis S. Benjamin, Jr. Chicago. 1945. University of Chicago Press. 476 pages. \$5.00.

Rufinus brought out his herbal in the latter part of the thirteenth century and, so far as is known, only one manuscript of it exists. This was threatened by the war, as were other priceless works. A rotograph of the manuscript was obtained from the Laurentian Library in Florence a few days before Italy entered the war, and the present book, itself in Latin, comes from this original Latin text. No opportunity was offered, of course, to re-examine the original due to the conflict. Thus this herbal is entitled to the word "unique." Rufinus is a forgotten botanist whose contributions were outstanding in the history of botany and medicine.

Foot Trails Bill

Hearings were held in October by the Committee on Roads of the House of Representatives on the Hoch Bill (H.R. 2142) to authorize construction of a national system of foot trails. This proposal is sponsored by the Appalachian Trail Conference and endorsed by many organizations interested in the outdoors, in trail use and in conservation. Reprints of the testimony at the hearing have been made, and a copy is available on request to the Conservation Department, American Nature Association, 1214 16th Street, N.W., Washington 6, D. C.

A Soldier's Letter

(The following item has been in type for some months, held out because of lack of space. Although peace has come in the interim, it seems appropriate to publish this letter in the February issue. —Editor.)

On February 12 Corporal Kenneth E. Graham was convalescing in an English hospital. On that day, also, he wrote a letter home, a letter that his mother has sent to us as an example of what at least one soldier thinks about. Corporal Graham wrote:

"Well, the cardinals back home should start whistling most any time now. Today is my birthday. After my birthday I always used to start looking for signs of spring.

"Things begin to change along about then. From then on till actual spring, I hardly notice the bad weather. I am too busy watching and listening for the first messengers of spring.

"It seems along about now, old man winter begins to be tired. He has to stop and rest, and, as you watch him, he begins to nod and presently goes to sleep. Then spring comes tiptoeing by and whispers to the buds that it is time to be stirring from their sleep. Most of the buds just sort of grunt; the pussywillow manages to open one eye and yawn. A cardinal chirps nearby and spring calls softly to him. He cocks his head and looks. When he sees who it is, he is so thrilled he flies to the top of the tallest maple to tell everyone else. He whistles his discovery but at the same time wakens old man winter. He rages with anger and spring quickly hides. But after a few days he again gets tired and sleepy. When he falls asleep, spring slips quietly out again, stirs the buds again, calls to the birds, brushes back snow from little mounds where flowers are asleep, she whisks over to a pond, melting the ice, and calls to the little frogs. They come up croaking. Old man winter is awakened by their chorus. Again he storms about with rage and spring has to hide. But he tires easily now and has to stop often and drowns off, giving spring a chance to slip out and waken some more of her sleeping friends. Finally old man winter gets so tired, he crawls back in a cave where he can sleep without being disturbed. This is what spring is waiting for. She doesn't have to be quiet now. She springs from hiding with a shout, and suddenly like an explosion, all her friends come tumbling out of bed to meet her. They all feel so fresh and happy after their long sleep they can hardly hold themselves. They dance, leap and sing with all their might. Such is the coming of spring.

"I sure wish I could be back in the States now, with the war over. It seems like I can't wait much longer. I am tired of this kind of life, and want to get back

home where I can live and do things the way I used to.

"Have you seen the January issue of the *Nature Magazine*? The front cover shows a pair of beautiful cardinals. You can imagine what that does to me. Sweeny sent it to me. He doesn't think much of the magazine, but sends it because I like it. Why, the front cover alone is worth many times the price of the magazine. It came yesterday and I think of it as a birthday present. Cardinals for my birthday.

"I hope you all are fine and dandy. I'm sure you are, for your letters sound so cheerful, and then, as I said, the cardinals back there should be whistling most any time now. And when the cardinal whistles, all is well."

Come, come, Sweeny, why don't you like us? Editor.

Readers for Robins

Some righteous indignation was stirred up—as we hoped it would be—by George R. Hopkins' disparaging remarks about the robin in our November, 1945, issue. We did not agree with him in the least, ourselves, but we believe in free speech, and Mr. Hopkins stated his case entertainingly.

From Colorado comes defense of the robin from a lady who says: "My garden was frozen four times in June, so it produced little more than we use each day. My poor corn froze, too, and then the cutworms decided to move in, but the robins saved it. Only a few stalks were destroyed by the worms. Every morning for a week, from six to twenty-five robins would be breakfasting in my corn. I wondered what so many birds could be so busily finding to eat, so I investigated and found a small army of cutworms; but after the robins came there were no more worms."

Young Donald Lee Fox of Bicknell, Indiana, was most indignant. In part he avers that robins "are useful for the fact that they eat thousands of crop-destroying insects. If they do eat angleworms, plums or cherries, it is either for food, to feed their young, or as a tidbit. If it is the first reason, animals and birds have to eat like we do. . . . As for their songs, I agree there are more beautiful songs, but a robin's song is beautiful for its sweet, simple notes. For anyone that doesn't like the robin and hates it instead, I have only to say that they are fakes and an avian washout."

Another reader says of the robins, "I have found them to be more friendly and companionable than any other bird, and they are welcome to share our fruit at any time."

So there, Mr. Hopkins. And your ears must have burned at what one lady had to say about you and your robin prejudices when she telephoned the office of the editor. But we are still for freedom of speech.

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Under the Microscope

By JULIAN D. CORRINGTON

ADVANCED HINTS

Mast's Theory of Locomotion in Amoeba. Ever since amoebas of various species were first observed, students of microorganisms have been intrigued by their method of locomotion. Every year thousands of newcomers to biological laboratories watch this performance through their microscopes and are mostly content to accept the old explanation that the protoplasm simply flows out into the pseudopodia, the animal progressing after the fashion of a glacier, or of water advancing along a dry gutter. As pseudopods are put forth in front, they are retracted in rear.

Now and then there have been those who have sought a real physicochemical analysis of this movement, and numerous theories for it have been proposed. Dellinger, in 1906, published a paper that included photomicrographs of an amoeba taken from the side—a novel idea, since all previous accounts had followed the customary procedure of looking down upon the creature from above. Dellinger found an amoeba actually walks, using pseudopods as legs, advancing them from above at the forward end, pushing them out and down until they contact the surface, followed by others doing the same thing, the effect being a foot-over-foot cartwheeling or rolling. Apparently some species move in this manner. For others, a comparison has been made by imagining an Oriental waterbag—a leather bag or skin partially full of water—placed on the ground and rolled in end-over-end fashion.

To explain how the animal effects this rolling-creeping, experiments were performed with inanimate materials. A drop of clove oil placed in a mixture of glycerin and alcohol will exhibit some of the features of amoeboid movement, and it was for a while thought that surface tension phenomena could be invoked as a full accounting. The matter took on more than academic interest when it was found that human white blood corpuscles, that great army that protects the body from invasion by bacteria and other foreign material, are capable of moving about in the blood stream, even against the current, and of leaving the vessels and wandering through the surrounding connective tissues, and that they do so by means of pseudopodia. Here was a medical slant to the topic, of great significance.

Another view was the "fountain theory," the pseudopods being extended by a forward movement in the endoplasm, or interior protoplasm of the cell, and a backward flowing of the

ectoplasm, or outer portion, like the motion of water particles in a playing fountain. All right as far as it goes, and visually demonstrable, this idea lacks a causal explanation.

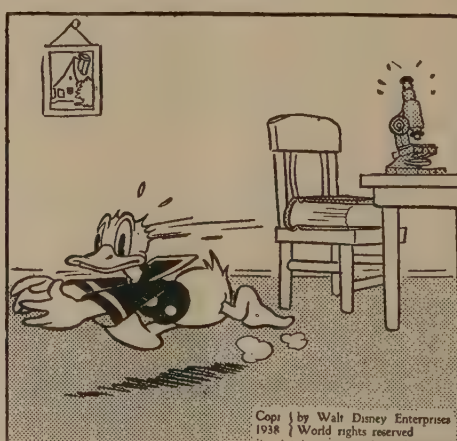
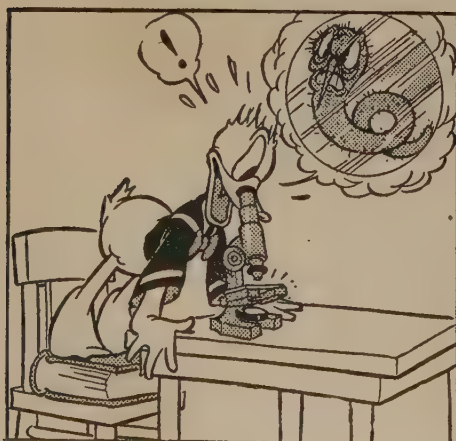
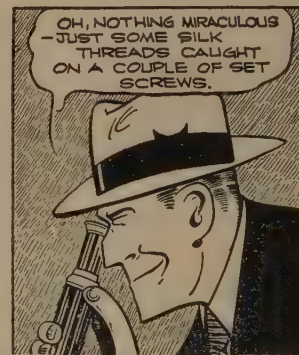
Protozoologists now generally subscribe to the most recent presentation, that of Professor S. O. Mast, of The Johns Hopkins University, who has reorganized the nomenclature of the amoeba's substance, and bases his conclusions on the findings of modern organic chemistry. In previous issues we have discussed "Diffusion and Osmosis" (June-July, 1944) and "Exploring States of Matter" (Dec., 1944), which should be reviewed unless the reader is familiar with the subject.

The bulk of the interior of an amoeba consists of a granule-containing fluid, the *plasmasol*, surrounded by a thinner layer of similar composition but of a more solid nature, the *plasmagel*. These two make up the region formerly termed the endoplasm. Outside the plasmagel is a *hyaline layer*—clear, glassy, and homogeneous, surrounded exteriorly by the *plasmalemma*, formerly termed the cell membrane. The hyaline layer plus the plasmalemma make up the ectoplasm of older descriptions. The hyaline layer can be seen all over the periphery of the cell except where the plasmalemma is in contact with the substratum, but is most prominent at the tip of an advancing pseudopod, where it forms the bulging *hyaline cap*.

In terms of colloidal chemistry, the protoplasm is a disperse system; in the plasmasol, water is the continuous phase, solid contents forming the disperse phase; in the plasmagel the phases are reversed, solid material being now the continuous phase, water the disperse phase. Conversion of sol to gel is termed gelation; of gel to sol is solation. Mast's explanation is

Here are two favorite actors in the comic strips, the vigilant and resourceful Dick Tracy and busy Donald Duck. Both of these friends in the funnies have turned microscopist, Tracy in the course of running to earth the perpetrator of a crime, Donald by way of exploration of the mysteries revealed by the instrument. Which of the two is the

more experienced microscopist, Dick, above, or Donald in the left-hand picture below? A copy of *Working with the Microscope* by Julian D. Corrington for the best answer to this question, an answer pointing out which is the better and why. Send your reply to Julian D. Corrington, 1214 16th St., N. W., Washington 6, D. C.



centered around the fact that such a system reverses continuously and readily. There is a core of plasmasol at the center of every pseudopod. Tension or contraction of the somewhat rigid but highly elastic plasmagel squeezes the enclosed plasmasol, which thus has to escape somewhere; it oozes through the plasmagel wall where that layer is thinnest and weakest, which is at the tips of advancing pseudopods. As it erupts out of the restricting envelope of plasmagel, the plasmasol undergoes gelation, reversing its phase to become plasmagel. This action has been compared to that of a volcano, which spouts liquid rock that immediately hardens into solid lava.

Collection of the fluid core against the plasmalemma of the forward moving pseudopod tip forms the hyaline cap. At the rear end of the animal the opposite action is taking place—solution of the peripheral plasmagel into the central, fluid plasmasol. These phase reversals explain the action seen and previously compared with the movement of water particles in a fountain. If the plasmalemma is attached to some object along which the amoeba is crawling, the advancing plasmasol pushes the plasmalemma along the object, continually pulling it forward from upper surface to lower, in a form of rolling motion, an action comparable to that of the endless belt of a caterpillar tractor.

As to the forces that cause tension in the plasmagel and phase reversals that effect movement, opinions differ. Some hold that all reactions of an amoeba are initiated from without; tropisms caused by stimulation, from agencies as light, heat, currents, and altering chemistry of the surrounding water, such as emanations from a food particle that impinge, through diffusion from their source, upon a portion of the cell and thus cause a response of a purposeful (positive or negative) though entirely automatic nature. Others see in the behavior of an amoeba some choice of action and a discrimination in response that represents the first faint glimmerings of the animal mind.

The next time you examine an amoeba culture, study locomotion anew, with Mast's explanation before you. Cut down the light, secure a very sharp focus, and follow the progressing tip of a pseudopod under high power. Even the beginner, if attentive to detail, can observe the phenomena here described.

THICKNESS OF SECTIONS

After the microscopist has learned the routine procedure of sectioning and has a certain number of microtome hours to his credit, he should avoid falling into the rut of cutting all materials into sections of the same thickness. Ten microns has become more or less standard as a thickness for ordinary histological preparations, but the technician should give

thought to the purpose for which the particular slides are being made.

The study of such an organ as the kidney or lung can be approached from more than one point of view. If fine details of individual cellular elements is the objective, then the sections should be very thin, not more than 5 microns—often preferably 2 microns. Such a slide would not provide any notion, however, of the relationships of the various parts that go to make up the organ, as pyramids, columns, or lobules of cells, and how they are arranged with reference to ducts, nerves, or blood vessels. For an overall picture of the microscopic anatomy of an organ, sections cut 50, or even as much as 100 microns, in thickness are not only far superior; they are essential. For the same reasons, such slides are best studied with the wide-field binocular rather than the ordinary compound microscope.

Embryological sections will prove most satisfactory when cut 10 microns, as well routine histological slides. Cytological studies, as for mitosis, meiosis, mitochondria, nuclear detail, and the like, require sections from 1 to no more than 5 microns. Always give a thought to the purpose before setting the thickness adjustment on your microtome.

HISTORICAL OUTLINE

The set of rules known as Koch's postulates are designed to safeguard the proof that a given pathogen causes a given disease.

1. The organism must be found in all lesions of the given disease and in such numbers and relationships as make it the probable cause.
2. It must be isolated in pure culture from these lesions.
3. The pure culture, when inoculated into a susceptible animal, must reproduce the disease in that animal.
4. The organism must then be isolated from the inoculated animal and proved to be the same species as the one inoculated.

Not every pathogen can be subjected to so drastic a set of procedures; the causal organism of syphilis, for instance, cannot be grown on artificial media; the typhoid bacillus produces its typical symptoms only in man and cannot be inoculated into test animals to fulfill condition three. These are exceptions, however, and the postulates did a great deal in keeping the young science of bacteriology on a sound basis during its formative years.

Koch was called to Berlin in 1880, and the following year witnessed one of his greatest triumphs, when he demonstrated the causal agent of tuberculosis, in London, with the aid of a differential stain prepared for the purpose by Paul Ehrlich. *Mycobacterium tuberculosis hominis* was at the time the number one killer of mankind, and is still high on the

Background for the Microscope

Equipment for the pursuit of microscopy may be as simple or as elaborate as individual inclinations dictate; but there is one item wholly indispensable—books! The microscope is handmaiden to all the sciences, and those who follow its adventuresome trail must have many a guide to direct along the right path.

Here is NATURE MAGAZINE'S selection of best bets. Check your library and add those that fail to answer the roll call. Buy one each month, or as often as you can. Suggest them as gifts. Buy them for the relative or friend whose chief joy is working with his microscope. Entries will be changed periodically; here is a basic list for a starter:—

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mortality tables. Koch's isolation of this germ, after overcoming enormous technical difficulties, created a sensation, and is considered by many as the most important single event in bacteriology. Koch also discovered the anthrax spore, and understood how it aided transmission of the disease. He grew pure cultures of this organism and inoculated mice, producing anthrax in them. He and his students discovered the pathogen of Asiatic cholera and he had at least something to do with the discovery of half-a-dozen more pathogens. He reformed the techniques of disinfection; invented a better illuminant for the microscope, built to his order by Ernst Abbe, and, in one way or another, had something to do with most of the important advances in his chosen science.

Among the less direct but most important of his numerous achievements was that of teaching and training a whole generation of prominent bacteriologists. His successes won him immediate fame and position, with large sums at his disposal for research. Students flocked to his laboratory from all over the world, and they have spread his methods to every nation. In later years Koch undertook many voyages, especially to the tropics, in search of new diseases to discover and conquer. Unfortunately, it must also be recorded that in these years he became spoiled by all the adulation accorded him and his essentially despotic nature frequently gained the upper hand. He was the master and would brook no dispute or interference; sometimes, too, he failed to keep abreast of the latest work of others, leading to quarrels that availed no one.

BEGINNER'S PRIMER

The Order Diptera, the flies, comprises some 73,000 described species, and is thus a middle-sized group among insect orders. Their importance to man, however, far exceeds such rank, as they clearly take first place as pests. In older texts, the Diptera appear next to the last among major divisions, the seat of honor as being the most highly evolved and specialized group going to the Hymenoptera—the bees, wasps, and ants. Recent works have reversed this sequence and consider the Diptera as standing at the very top of the great assemblage of insects.

The word "fly" has had an interesting history. From old Anglo-Saxon and related sources, it originally meant any insect, and such a usage survives today in numberless compounds with other words as common names of insects belonging to different orders and that are not flies at all, such as butterfly and firefly. This is similar to incorrect application of other common names, as lightning bug, which is a beetle and not a bug. Diptera known by names other than fly include mosquitoes, gnats, midges, and punkies, or the highly-expressive no-see-ums.

Members of this order are distinguished by having a single pair of functional wings, hence the name, two-wings, or Diptera. These are the first pair or mesothoracic wings; the second pair, or metathoracic wings, are reduced to tiny vestiges, the halteres, which are slender, thread-like, knobbed, and are said to aid in flight as balancers. The true wings have relatively few veins, and are occasionally vestigial or absent.

The head is described as hypognathous, meaning that its axis is vertical, with the mouthparts directed downward or even backward. The antennae vary from simple to complex; the compound eyes are large, often meeting across the top of the head; and there are usually three ocelli. The integument is thin and parchment-like, flies seldom having the skin thickened with chitin as is the case with bugs and beetles. Legs vary from short to extremely long, as may be noted in comparing a housefly with a cranefly or mosquito; the tarsus has five segments, and usually there is one pair of claws, with one pair of pulvilli (singular, pulvillus) or cushions beneath the claws, and a single empodium, a small appendage between the pulvilli.

Antennae present the greatest array of types of any insect order. They may be setiform, that is, slender and tapering, like a bristle; filiform, long and slender but not tapering, the last

segment being about as large as the first; moniliform, like a string of beads, each segment more or less globular; serrate, with saw teeth; pectinate, comb-like; plumose, similar to pectinate but the tooth-like processes long and feathery; whorled, a modification of the setiform, filiform, or moniliform antenna having one or more whorls of hairs around each segment; clavate, shaped like a club, each segment increasing in diameter; geniculate, or elbowed, with a bent joint; stylate, the terminal segments dwindling abruptly into a slender column; or aristate, the termination in the form of a hair or bristle. The arista may be simple or complex, furcate (forked) or entire, terminal or dorsal, bare or hairy, the hairs plumose or whorled, its base globular or normal. In position, the antennae may be erect, porrect (extending horizontally), decumbent (prostrate), or depressed and lying in grooves.

Mouthparts are likewise of many types, formed for piercing, sucking, lapping, rasping, or are atrophied and functionless, especially in males. Most generally the various parts are modified into six long slender bristles, enclosed in a sheath representing the lower lip or labium. Metamorphosis is complete, the larvae being termed maggots. These are commonly whitish to yellowish to somber-colored, naked, headless, legless, without eyes and with reduced mouthparts. The pupa is free in some groups; in others it is enclosed in the last larval skin (or last two), making a cocoon-like structure termed a puparium.

Identification of adults is based principally on wing venation, antennal type, and chaetotaxy. This last word denotes a description and mapping of thoracic sutures and bristles. Species of larvae are determined mainly by the number, position, and characteristics of the spiracles. Neither of these studies is easy; taxonomy of the Diptera is scarcely a subject proper to a Beginner's Primer!

In our next installment we shall describe some typical life cycles and discuss habits and economic importance, and later specify a number of slide preparations.

TRADE NOTES

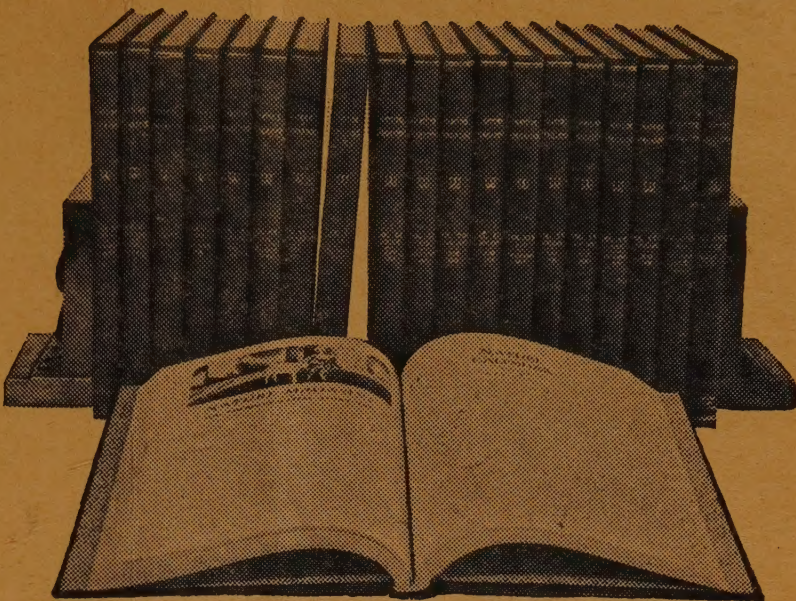
Biography Dr. Francis B. Sumner's *The Life History of an American Naturalist* is an autobiography and philosophical commentary on our life and times by a distinguished research scientist. Beginning with earliest recollections, the author dissects his family and forebears with merciless realism, constructing his own heredity and discussing environmental influences. During these accounts and the later chapters on his boyhood, education, post-graduate studies, and earlier married life, the author depicts himself in such an unfavorable manner, the reader wonders how anyone with the background of his training and travels to Rio, Europe, and Africa could remain so naive, so shy, so unadaptable; the impression given is of an unattractive, half-developed character.

Later chapters, however, dispel this impression. Without egoism, Dr. Sumner goes on to explore his own real worth and accomplishments in many fields. The sketches of his fellow students, contemporary scientists, and notables whose paths have crossed his own are well done and interesting; the accounts of his work at Woods Hole, at the Scripps Institute, of his researches on fish and on mice, of the inner workings and rise to prominence of the Scripps Institute, give one a picture of the flowering of mind and method of a first-class research scientist. Above all, his views on important general topics, as business, politics, conservation, birth control, religion, are so charged with sane and clear thinking, that the reader at last puts down the volume with satisfaction and feels that he has witnessed the development through many years and changing trials and vicissitudes of a mature character of unusual breadth of vision. The youth was a naturalist, the man a scientist, but the final product is a philosopher. The Jaques Cattell Press, Lancaster, Pa., 1945. \$3.00.

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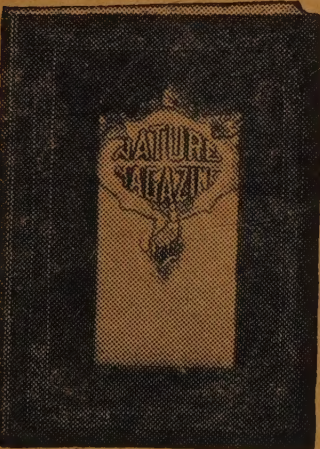
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